NOTE

This Microfiche meets the quality requirements of the American National Standard for Microfiche of Documents (ANSI PH5.9-1975). However, because of imperfections in the document from which it was made, it contains images that are illegible or difficult to read. The source document for this microfiche is the best copy that could be obtained prior to filming.

CIS Congressional Information Service Washington D C

S. HRG. 101-344

ESTABLISHING THREE CENTERS FOR METAL CASTING COMPETITIVENESS RESEARCH

HEARING

BEFORE THE

SUBCOMMITTEE ON
ENERGY RESEARCH AND DEVELOPMENT

OF THE

COMMITTEE ON
ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

FIRST SESSION

ON

S. 775

TO REQUIRE THE SECRETARY OF ENERGY TO ESTABLISH THREE CENTERS FOR METAL CASTING COMPETITIVENESS RESEARCH

SEPTEMBER 21, 1989

Printed for the use of the
Committee on Energy and Natural Resources

U.S. GOVERNMENT PRINTING OFFICE

24-851 WASHINGTON : 1989

For sale by the Superintendent of Documents, Congressional Sales Office
U.S. Government Printing Office, Washington, DC 20402

S311-4

COMMITTEE ON ENERGY AND NATURAL RESOURCES

J. BENNETT JOHNSTON, Louisiana, *Chairman*

DALE BUMPERS, Arkansas	JAMES A. McCLURE, Idaho
WENDELL H. FORD, Kentucky	MARK O. HATFIELD, Oregon
HOWARD M. METZENBAUM, Ohio	PETE V. DOMENICI, New Mexico
BILL BRADLEY, New Jersey	MALCOLM WALLOP, Wyoming
JEFF BINGAMAN, New Mexico	FRANK H. MURKOWSKI, Alaska
TIMOTHY E. WIRTH, Colorado	DON NICKLES, Oklahoma
KENT CONRAD, North Dakota	CONRAD BURNS, Montana
HOWELL T. HEFLIN, Alabama	JAKE GARN, Utah
JOHN D. ROCKEFELLER IV, West Virginia	MITCH McCONNELL, Kentucky

DARYL OWEN, *Staff Director*
D. MICHAEL HARVEY, *Chief Counsel*
FRANK M. CUSHING, *Staff Director for the Minority*
GARY G. ELLSWORTH, *Chief Counsel for the Minority*

SUBCOMMITTEE ON ENERGY RESEARCH AND DEVELOPMENT

WENDELL H. FORD, Kentucky, *Chairman*
JOHN D. ROCKEFELLER IV, West Virginia, *Vice Chairman*

DALE BUMPERS, Arkansas	PETE V. DOMENICI, New Mexico
HOWARD M. METZENBAUM, Ohio	MITCH McCONNELL, Kentucky
TIMOTHY E. WIRTH, Colorado	DON NICKLES, Oklahoma
HOWELL T. HEFLIN, Alabama	CONRAD BURNS, Montana
	JAKE GARN, Utah

J. BENNETT JOHNSTON and JAMES A. McCLURE are Ex Offico Members of the Subcommittee
PAUL BARNETT, *Counsel, Majority*
RICHARD D. GRUNDY, *Senior Professional Staff Member, Minority*

CONTENTS

	Page
S. 775	6

STATEMENTS

Cocks, Derek, technical director, North American Die Casting Association	83
Ford, Hon. Wendell H., U.S. Senator from Kentucky	1
Heflin, Hon. Howell T., U.S. Senator from Alabama	26
Kiplinger, Walter, vice president, Government Affairs, American Cast Metals Association	32
McClure, Hon. James A., U.S. Senator from Idaho	4
Piwonka, Dr. Thomas S., director, Metal Casting Technology Center, the University of Alabama	46
Shelby, Hon. Richard, U.S. Senator from Alabama	9
Smith, Ronald D., president, GAMCO Products Co., on behalf of the North American Die Casting Association, accompanied by Derek Cocks	83
Streb, Alan J., Deputy Assistant Secretary for Conservation, Department of Energy	16
Williams, Orian, assistant to the president, Glass, Molders, Pottery & Plastics Workers Union	74

APPENDIX

Responses to additional questions	105

ESTABLISHING THREE CENTERS FOR METAL CASTING COMPETITIVENESS RESEARCH

THURSDAY, SEPTEMBER 21, 1989

U.S. SENATE,
SUBCOMMITTEE ON ENERGY RESEARCH AND DEVELOPMENT,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The subcommittee met, pursuant to notice, at 2 p.m. in room SD-366, Dirksen Senate Office Building, Hon. Wendell H. Ford, presiding.

OPENING STATEMENT OF HON. WENDELL H. FORD, U.S. SENATOR FROM KENTUCKY

Senator FORD. Ladies and gentlemen, we will go ahead and start the hearing.

Senator Shelby and I will have to go vote. We have about five minutes of testimony from him, and I think we will do that, and then recess until I have an opportunity to vote and come back.

Senator Shelby, we are delighted to have you here. I will submit my statement for the record as if read. And we look forward to your testimony. You may proceed.

[The prepared statements of Senators Ford and McClure and the text of S. 775 follow:]

STATEMENT OF SENATOR WENDELL H. FORD

Subcommittee on Energy Research and Development

Hearing on S.775, a Bill to Establish Three Centers for Metal Casting Research

September 21, 1989

Good afternoon. Today, we will receive testimony on S.775, a bill to establish three centers for metal casting research. S.775 was introduced on April 13, 1989, by my colleague, the distinguished Senator from Alabama, Richard Shelby. I am pleased that he is able to testify before us today.

Foreign competition is hurting one of America's oldest industries, the foundry industry. U.S. foundries once dominated the international market. The last twenty years have witnessed the demise of half of America's foundries, putting tens of thousands of workers out of work.

Foreign government subsidies make it possible for foreign companies to develop and use new technology quicker and more efficiently then American companies. Even technology developed in the United States. Foreign nations, such as Japan, France, Germany and even the Soviets, have created centralized research programs.

Most American foundries are small, often passed down from generation to generation. They are unable to fund expensive, but needed, research projects on their own. No centralized programs exist that American foundries can participate in. In fact, twelve U.S. steel companies pay almost $200,000 annually to be members of a British

research association. We need to find a way to help American foundries compete effectively in the international market.

This legislation is intended to help develop and put to use new technology. The purpose of the hearing today is to learn more about the problems facing the castings industry, particularly foreign competition, and how effectively this legislation will deal with those problems. The witnesses gathered here today are very distinguished and I am honored to have them.

OPENING STATEMENT
SENATOR JAMES A. McCLURE
COMMITTEE ON ENERGY AND NATURAL RESOURCES
SEPTEMBER 21, 1989

INDUSTRIAL ENERGY CONSERVATION

Good afternoon. American industry is encountering increasingly tough international competition, due in part to a worldwide explosion of new technologies. Our trade deficit is partially explained by new foreign competition that is capturing markets previously dominated by the United States but it is equally explained by a failure of many American industries to modernize.

The challenge is whether we can be more effective in delivering American inventions and technological know-how to the marketplace as a source for new businesses and jobs. This is true whether we are talking about upgrading existing technologies or introducing new technologies to the marketplace.

If we as a nation are to remain competitive in international markets, we must move to recapture the energy conservation gains of the 1970's that are eroding due to lower oil prices. But we must also generally improve energy efficiency throughout our economy.

With this objective in mind, for the last several years this Committee has actively pursued an aggressive legislative program which, in this Congress, includes S. 488, the Renewable Energy and Energy Efficiency Technology Competitiveness Act of 1989, and S. 550, the Department of Energy Laboratory Cooperative Research and Technology Competitiveness Act of 1989.

Opportunities exist throughout the industrial sector of our economy for

cooperative arrangements between the private sector and certain DOE facilities. S. 488, as recently reported by the Committee on Energy and Natural Resources, provides the Department of Energy with generic authority to undertake joint government and industry activities to commercialize new energy technologies. Under such arrangements, the United States can expedite the transfer of those technologies with significant economic importance into the marketplace so as to enhance the United States' competitiveness in both domestic and international markets.

This legislation purports to builds on DOE's experience with the management of both the Clean Coal Technology program and, more recently, the Steel and Aluminum Energy Conservation and Technology Competitiveness Act of 1988 (Public Law 100-680). That Act addresses the commercialization of new and improved steel and aluminum manufacturing and processing technologies, in general, including new metal casting technologies. The current DOE program thus addresses development of the same technologies as S. 775. In addition, cooperative research is being undertaken by industry.

Therefore, it is important that the witnesses in support of this specific legislation must explain what can be achieved by the establishment of three Centers for Metal Casting Competitiveness Research that cannot be accomplished by DOE's industrial energy conservation program. I would suggest that the issue here, as it is throughout the Federal government, is not inadequate authority but insufficient funds to go around. Thank you Mr. Chairman.

II

101ST CONGRESS
1ST SESSION

S. 775

To require the Secretary of Energy to establish three Centers for Metal Casting Competitiveness Research.

IN THE SENATE OF THE UNITED STATES

APRIL 13 (legislative day, JANUARY 3), 1989

Mr. SHELBY introduced the following bill; which was read twice and referred to the Committee on Energy and Natural Resources

---

A BILL

To require the Secretary of Energy to establish three Centers for Metal Casting Competitiveness Research.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. FINDINGS.

The Congress finds that—

(1) metal castings are a component of all manufactured items imported into or exported from the United States, or are used in the production of such items;

(2) the encouragement and maintenance of a technically advanced United States metal casting industry

is essential to the competitiveness of all American industry;

(3) maintaining a viable metal casting industry is vital to the national security and economic well being of the United States; and

(4) the promotion of technology competitiveness and energy conservation in the United States metal casting industry by the Federal Government is necessary to maintain a viable metal casting industry.

SEC. 2. ESTABLISHMENT OF CENTERS.

The Secretary of Energy shall, as a part of the Department's energy conservation programs, establish three Centers for Metal Casting Competitiveness Research for the purpose of performing or promoting the performance of research on issues with respect to the technology competitiveness and energy conservation of the United States metal casting industry.

SEC. 3. LOCATION OF CENTERS.

The Secretary shall establish the centers under section 2 in locations—

(1) where the United States metal casting industry is concentrated; and

(2) if possible where institutions already exist which—

(A) perform the kind of research prescribed in section 2;

(B) have a multidisciplinary group of investigators presently working on metal casting projects; and

(C) possess laboratory facilities capable of duplicating essential metal casting processes.

In locating such centers, the Secretary shall consider distributing them geographically so as to aid in the transfer of technology to the metal casting industry.

○

STATEMENT OF HON. RICHARD SHELBY, U.S. SENATOR FROM ALABAMA

Senator SHELBY. Mr. Chairman, I appreciate your letting me move ahead like this.

I do have an opening statement for the record, and I would ask unanimous consent.

Senator FORD. Without objection, the total statement will be included in the record.

Senator SHELBY. And I would like to, Mr. Chairman, make several points, if I may.

Senator FORD. You may proceed.

Senator SHELBY. Mr. Chairman, as you well know, coming from Kentucky, 20 years ago there were 5,700 hundred casting locations in the United States. Today, there are approximately 3,700 foundries left. Today, less than 50 percent of the number of people who were employed in steelmaking in '68 are in the industry.

Reduction in foundry numbers—our foreign competitors view foundry as high technology, but we have not. Our foreign competitors, such as West Germany, for example, the National Foundry Institute has developed a computer program to design the gating and feeding of casting.

The program is being marketed in Europe and is about to be marketed here in the United States. Why, because the United States does not have a similar program, because of the lack of national funding; advanced metal casting technology is developed not here but overseas.

What is the solution? Mr. Chairman, I submit to you that part of it would be this legislation that I have introduced, the creation of a federal support program of university-based centers for metal casting competitive research. It would provide knowledge for American metal casters. It would benefit all American industries and workers.

Virtually every manufactured product imported into or exported from the United States, Mr. Chairman, contains or is made by machines which contain castings. It would also contribute to advanced research and development. It would create efficiencies in the marketplace that we all are striving for, thus increasing competition, reducing cost, thereby enhancing consumer welfare.

The castings are at the beginning, as you well know, of the value-added cycle. Therefore, improvements in casting technology, which lower the cost of castings, have a large effect in lowering final assembled products. And there are many, many other things that the legislation would bring about.

It would establish three regional metal casting technology centers for the purpose of advancing technology and research and applying these advancements to basic industry functions. It would utilize the best talent available for scientific research, because of the government, the private sector and academia, will work together on the projects. It will encourage the maintenance of a technically advanced United States steel metal casting industry that is essential to the competitiveness of all our industry, including our defense base.

Mr. Chairman, the approach I believe is essential to the recapturing of lost market-share that we are all interested in, and the application of energy conservation methods to the metal casting industry. Small business—it would basically affect small business—mostly small and medium-sized businesses; 94 percent employ less than 250 employees in this industry. Because of the size in yearly expenses incurred, an average company cannot afford research and development projects. As a consequence, over the past 20 years 2,000 foundries, as I said earlier, have closed. The U.S. has lost its advantageous position in the world marketplace. And unnecessary expenses exist in the marketplace. I believe this is one of the steps that we need to take.

Mr. Chairman, I appreciate your interest in this, in providing me an opportunity to appear before your committee.

[The prepared statement of Senator Shelby follows:]

STATEMENT

OF

HONORABLE RICHARD SHELBY

IN SUPPORT OF S. 775

A BILL TO ESTABLISH THREE CENTERS FOR METAL CASTING

COMPETITIVENESS RESEARCH

BEFORE THE

SUBCOMMITTEE ON ENERGY RESEARCH AND DEVELOPMENT

OF THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES

UNITED STATES SENATE

SEPTEMBER 21, 1989

SD-366

WASHINGTON, D.C. 20510

MR. CHAIRMAN, I WANT TO THANK YOU FOR SCHEDULING A HEARING ON S. 775, LEGISLATION TO ESTABLISH NATIONAL METAL CASTING CENTERS TO CONDUCT RESEARCH, DEVELOPMENT AND ENGINEERING PROGRAMS DESIGNED TO INCREASE THE COMPETITIVENESS AND PROFITABILITY OF OUR DOMESTIC CAST METALS INDUSTRY.

ACCORDING TO THE METAL CASTING TECHNOLOGY CENTER AT THE UNIVERSITY OF ALABAMA, THE AMERICAN METAL CASTING INDUSTRY PRODUCES $25 BILLION WORTH OF PRODUCTS ANNUALLY AND EMPLOYS APPROXIMATELY 220,000 PEOPLE. MOST OF THE 3,700 FOUNDRIES LOCATED IN THE UNITED STATES ARE SMALL AND MEDIUM-SIZED COMPANIES. ONLY 22 FOUNDRIES HAVE SALES OVER $100 MILLION EACH YEAR.

CASTINGS ARE COMPONENTS OF VIRTUALLY EVERY MANUFACTURED PRODUCT MADE IN THE COUNTRY. CASTINGS ARE AT THE BEGINNING OF THE VALUE-ADDED CYCLE; THEREFORE, IMPROVEMENTS IN CASTING TECHNOLOGY WHICH LOWER COST OF CASTINGS HAVE A LARGE EFFECT IN LOWERING FINAL ASSEMBLED PRODUCT COSTS. IF THE TECHNOLOGY CAN BE DEVELOPED WHICH WOULD LOWER THE COST OF FINISHED CAST COMPONENTS (I.E., COMPONENTS READY FOR INSTALLATION IN THE FINAL ASSEMBLY) BY 30-50%, VERY SUBSTANTIAL SAVINGS TO ALL AMERICAN INDUSTRY WHICH USES CASTINGS IN THEIR PRODUCTS MAY BE EXPECTED.

VIRTUALLY EVERY MANUFACTURED PRODUCT IMPORTED INTO OR EXPORTED FROM THE UNITED STATES CONTAINS OR IS MADE BY MACHINES WHICH CONTAIN CASTINGS. UNFORTUNATELY, THE IMPORTANCE OF THE METAL CASTING INDUSTRY IS NOT WELL KNOWN OUTSIDE THE FOUNDRY COMMUNITY AS IT SHOULD BE. THEREFORE, THE PROMOTION OF MEANS TO STRENGTHEN THE INDUSTRY HAS NOT BEEN VIGOROUSLY PURSUED.

HISTORICALLY, METAL CASTING IS ONE OF THE OLDEST AND MOST PROFITABLE OF AMERICAN INDUSTRIES. OUR CAPITOL DOME WAS CAST AND ERECTED IN THE MID-19TH CENTURY BY AN AMERICAN COMPANY WHICH HAS SINCE SUCCUMBED TO THE SAME FATE AS MANY OF THE GREAT U.S. FOUNDRIES OF THE 19TH AND EARLY 20TH CENTURIES. FOREIGN TRADE PRACTICES, COUPLED WITH OUR FAILURE TO MAINTAIN OUR TECHNOLOGICAL ADVANTAGE, HAVE CREATED A SITUATION WHEREBY U.S. FOUNDRIES ARE FIGHTING A LOSING BATTLE TO REGAIN THEIR SHARE OF AN INCREASINGLY COMPETITIVE MARKET.

HOWEVER, OUR FOREIGN COMPETITORS HAVE TAKEN A KEEN INTEREST IN THEIR FOUNDRY RESEARCH CENTERS. IT HAS BEEN OBSERVED THAT SEVERAL COUNTRIES--CANADA, WEST GERMANY, BRAZIL, ITALY, FRANCE, INDIA, SOUTH AFRICA, AND GREAT BRITAIN--VIEW THE FOUNDRY INDUSTRY AS HIGH TECHNOLOGY. BECAUSE OF THIS VIEW, THESES COUNTRIES AGGRESSIVELY FUND NATIONAL FOUNDRY RESEARCH CENTERS.

THE REDUCTION IN THE NUMBER OF FOUNDRIES IN THE UNITED STATES FROM 5,700 TO 3,700, ENHANCED INTERNATIONAL COMPETITION, AND THE DISAPPEARANCE OF FOUNDRY TRAINING IN UNIVERSITIES ILLUSTRATE THE NEED FOR A POLICY TO LEVEL THE PLAYING FIELD.

S. 775 CAN IMPROVE THE FOUNDRY INDUSTRY'S COMPETITIVE STANCE IN THE INTERNATIONAL MARKETPLACE. IT IS DESIGNED TO ESTABLISH THREE REGIONAL METAL CASTING TECHNOLOGY CENTERS FOR THE PURPOSE OF ADVANCING TECHNOLOGY AND RESEARCH IN THIS FIELD AND APPLYING THESE ADVANCEMENTS TO BASIC INDUSTRY FUNCTIONS. THE ENCOURAGEMENT AND MAINTENANCE OF A TECHNICALLY ADVANCED UNITED STATES METAL CASTING INDUSTRY IS ESSENTIAL TO THE COMPETITIVENESS OF ALL AMERICAN INDUSTRY.

I BELIEVE MY PROPOSAL IS AN EXEMPLARY ILLUSTRATION OF ACADEMIA, GOVERNMENT AND THE PRIVATE SECTOR WORKING TOGETHER FOR THE ECONOMIC WELL-BEING OF THE COUNTRY. THE CREATION OF A PROGRAM WHOSE PURPOSE IS TO PROMOTE THE PERFORMANCE OF RESEARCH ON ISSUES WITH RESPECT TO THE TECHNOLOGY COMPETITIVENESS AND ENERGY CONSERVATION OF THE UNITED STATES CASTING INDUSTRY IS AN INVESTMENT THAT WILL BENEFIT ALL AMERICANS.

MR. CHAIRMAN, THERE IS BICAMERAL SUPPORT FOR THIS PROPOSAL. MY FRIENDS AND FORMER COLLEAGUES, CONGRESSMEN BEN ERDRIECH AND CLAUDE HARRIS, HAVE INTRODUCED IDENTICAL LEGISLATION. THERE ARE OVER 100 COSPONSORS. ALSO, HEARINGS HAVE BEEN HELD.

I, ALONG WITH MY COSPONSORS SENATOR HEFLIN AND SENATOR KOHL, URGE PASSAGE OF S. 775.

Senator FORD. Senator, you are mighty nice to come and take your time under these circumstances.

I assure you that I am in sympathy with your position, and we will have additional testimony following yours. Your colleague, Senator Heflin, is a member of this committee, and he will be here shortly.

Senator SHELBY. He is also cosponsoring my bill.

Senator FORD. And Senator Kohl.

Senator SHELBY. That is right. And McConnell. And I am sure that there are going to be others. Senator Heinz talked with me today. He just found out about the bill coming from Pennsylvania, I am sure he would be interested as you are.

Senator FORD. You will find that this piece of legislation will take on a life of its own.

So now, we will recess until I have a chance to vote and should be back in about 10 minutes.

[Recess]

Senator FORD. The committee will come into order.

The next witness will be Hon. Alan J. Streb, Deputy Assistant Secretary, conservation and renewable energy programs, U.S. Department of Energy.

Mr. Secretary, we are delighted to have you and apologize for holding you up. But there is nothing I can do about it.

You may proceed.

STATEMENT OF ALAN J. STREB, DEPUTY ASSISTANT SECRETARY FOR CONSERVATION, DEPARTMENT OF ENERGY

Mr. STREB. Thank you, Mr. Chairman.

I have a statement which I will submit for the record.

Senator FORD. It will be included in the record as if given, and staff, if staff would close the door back there. It might be a little helpful to us.

Mr. STREB. I appreciate this opportunity to appear before you today to provide comments on S. 775, which would require the Secretary of Energy to establish three Centers for Metal Casting Competitiveness Research.

The metal casting industry uses over 250 trillion Btus of energy annually in producing products valued at over $20 billion. The Department of Energy supports the need for R&D and metal processing and casting. Especially, as such research contributes to improved efficiency and competitiveness. The Department of Energy as part of the energy conservation program, has in the past, and does currently support research and development related to the needs of the metal casting industry.

Within the past four to five months, we have made two financial assistance awards to support the research and development in the field of metal casting as part of our material processing R&D program. Opportunities for future financial assistance are available through our Materials Processing Subprogram, and also through the Metals Initiative as authorized by Public Law 100-680.

Both programs are managed from the Office of Industrial Programs. Many institutions already exist with strong capabilities to perform the technology development which will contribute to the

needs of the metal industry. For this reason the Department does not support the need for the Department of Energy to establish new research and development centers, as proposed by S. 775.

We do support appropriate research and development which will yield the greatest possible benefit to the casting industry.

In summary, the Department strongly supports a healthy, viable metal casting industry, one that is technologically competitive with foreign producers. However, we believe that the existing programs supported by the Department and others are adequate to accomplish the work necessary to achieve this objective.

I would be pleased to address any questions that you may have.

[The prepared statement of Mr. Streb follows:]

Statement of Alan J. Streb

Deputy Assistant Secretary for Conservation

U. S. Department of Energy

before the

Subcommittee on Energy Research and Development

Committee on Energy and Natural Resources

U. S. Senate

September 21, 1989

Mr. Chairman and Members of the Committee, I appreciate this opportunity to appear before you today to provide comments on S. 775, proposed legislation which would require the Secretary of Energy to establish three Centers for Metal Casting Competitiveness Research. The Department of Energy testified on similar legislation (H.R. 1243) before the House Committee on Science, Space, and Technology on July 18, 1989. The Congress, and in particular this Committee, is to be commended for recognizing the significance of the casting industry, from both energy and economic standpoints. This industry uses over 250 trillion BTUs of energy annually in producing products having a value of more than $20 billion. The Department of Energy also recognizes the significance of this industry. We are aware, and concerned, that the domestic industry faces growing competition from producers in foreign nations. Keeping pace will require the development of new, more productive technology. DOE is currently supporting research and development of improved metals casting technologies, and includes this industry in its plans for future funding.

At this time I would like to briefly describe our current research efforts and plans, and then address the Department's views on S. 775. Within the past three months we have made two financial assistance awards to support research and development in the field of metal casting. These projects were selected from responses to a competitive solicitation. One project will investigate precision evaporative pattern casting technology, while the other will involve on-line process modeling of a cupola furnace. Both projects feature significant industry involvement, including 50 percent non-Federal cost sharing. These projects are funded by the Materials Processing Sub-program within the Office of Industrial Programs.

Looking to the future, DOE is currently implementing the Metals Initiative, established by The Steel and Aluminum Energy Conservation and Technology Competitiveness Act of 1988 (Public Law 100-680). This program seeks to enhance the energy efficiency and industrial competitiveness of the American steel, aluminum, and copper industries. Pursuant to this Act, DOE has issued a Research Plan after considering recommendations from industry, including organizations within the casting industry. This Plan identifies areas of opportunity for casting research in both the ferrous and aluminum sectors. One noteworthy feature of this program is the requirement for non-Federal cost sharing of at least 30 percent. DOE consistently finds that financial support from industry is absolutely essential for significant industry involvement and interest.

In addition, the Fiscal Year 1990-1994 Energy Conservation Multi-Year Plan identifies foundry industry research as an area of interest within the Materials Processing Sub-program. Specific topics which we believe are worth investigating are:

- Novel raw materials and molten metal beneficiation;
- Optimization and process control of the foundry cupola;
- Development of new molding methods and materials; and
- Development and optimization of new pattern-making technology.

These two ongoing program areas, the Metals Initiative and Materials Processing, each offer potential financial assistance in areas of interest to

the metal casting industry. Under the Materials Processing Sub-program, DOE has identified specific research areas and solicited proposals. Additional projects may result from either unsolicited proposals, or in response to another formal solicitation. The Metals Initiative on the other hand requires the metals industry itself to take the initiative to identify meritorious projects and submit proposals to DOE for funding consideration.

Regarding S. 775, DOE does not support the use of Federal funds for the establishment of new research centers for research and development on metals casting as their primary objective. Institutions already exist which are capable of performing research and development consistent with the purposes of this bill. For example, we noted recently the announced formation of a research and development center for lost-foam casting which involves a university and four industrial partners, without Federal involvement. Existing programs within DOE are sufficiently broad and flexible to permit funding of meritorious projects at these centers. Furthermore, DOE policy is consistent with the transfer of resultant technology to industry, as envisioned by S. 775. In fact, technology transfer could be impeded if activities are locked into specific centers rather than being performed with or by industry.

In summary, DOE strongly supports a healthy and viable metal casting industry, one that is technologically competitive with foreign producers. However, DOE believes that existing programs are the appropriate mechanisms to accomplish the research and development efforts required in this area.

Thank you for the opportunity to testify. I would be pleased to address any specific questions you may have at this time.

Senator FORD. Thank you, Mr. Secretary.

First let me ask you this, why does the Department of Energy feel that these centers will slow transfer of technology?

Mr. STREB. We believe that the most effective way of transferring technology to the industry is to involve industry directly in the performance of the research and development under a cost-shared agreement.

Under cost-shared agreements with industry for specific research and development, they effectively buy into the technology at the front-end and have a commitment to that particular technology development, if it should be successful. Secondly, under the Metals Initiative, for example, we have a special arrangement made wherein intellectual rights and ownership of patents that emerge from the research and development are automatically conveyed at the front-end to the industry and therefore are available to them to use in the most profitable manner.

Senator FORD. Mr. Secretary, why is it that many of our industries are buying into the United Kingdom's research center and they are not participating here or not having the opportunity to participate; they are spending a great deal of money joining U.K.'s research approach.

And that indicates to me that that country is going to be in the lead. And they will have it. Japan will be in the lead and Germany will be in the lead, and we find us here in this country, trailing like we do in everything else. We are good at research and development, but we never get it into the marketplace.

Mr. STREB. The only reason I can imagine that the U.S. companies may be buying into centers that are being operated overseas, is that they see some specific advantage in complementing their capability with that of the U.K. and Germany.

I am not familiar with any specific circumstances like this, but I see no reason that the same industries cannot form consortia, and work within the American research institutions that already exist to accomplish the same end result.

Senator FORD. But, it is apparent to this senator that what you are doing is not working or we would not have this proposal before us today. And the interest in research and development and the ability immediately to put it on the floor becomes very important.

I do see that in with what little knowledge I have of the industry it seems like that we are just not moving in a direction that we ought to and we find ourselves less and less one of the competitors.

And competitiveness, as you know, is a byword around this place, but if we reduce the ability to compete, then we have taken a step backward instead of a step forward.

Let me ask you this, Mr. Secretary, would this bill duplicate current efforts, specifically under the Steel and Aluminum Conservation Act of 1988?

Mr. STREB. I am sorry, did you say, would it duplicate?

Senator FORD. Yes.

Mr. STREB. The initiative actually could be accommodated under the Steel Initiative or Conventional Research and Development Program. The research that is being proposed can be supported under the existing programs.

Senator FORD. How?

Mr. STREB. Companies would, in the case of the Metals Initiative, for example, form consortia amongst themselves and propose to perform focused research in the area of casting technology or other technologies that relate to the Metals Initiative; and submit them to the department for consideration within the bounds of the funds that we have available. They can be supported.

Senator FORD. Well, Mr. Secretary, is not that just a little slice of the conservation act? It does not set up an entity that would do the research and put it right on the floor with an industry that is very vital, is needed in this country.

It seems like to me, what you are saying is, they could put together and submit it and if you have money you consider it. You say they have to get together, and they have to have a consortium. They have got to come to us, and we have enough money, we will consider it.

But only when you look at the Conservation Act of 1988, it is just a little bitty slice.

Mr. STREB. It is as big a slice as Congress appropriates funds.

Senator FORD. No, no, it is as much as OMB will let us have.

Mr. STREB. Yes, sir. That is certainly a consideration as well.

Senator FORD. That is right. If you have to wet-pin a third of the votes, so you control things around here, and you know that.

Mr. STREB. I think the key is that within a certain amount of available resources, we feel that we can accomplish more through a focused research and development effort, as opposed to a program which would have to provide continuous care and feeding for research centers, which perhaps do not have the same degree of focus as a program that we believe that we operate right now.

The programs that we undertake, under the metals initiative, for example, an alternative means for producing steel, are very substantial programs. It is anticipated that we will be spending about $30 million of federal funds over a period of four or five years for that activity.

Once committed to a certain objective, we feel duty-bound to follow through with that objective, and so far we have not had any trouble with OMB in supporting us for our annual needs on that basis.

Senator FORD. Well, then you say $30 million, tell me how DOE, how much will DOE spend on an annual basis in the future in supporting metal casting research.

Mr. STREB. At the moment, and this is only at the moment, and as a result of a solicitation that we conducted this year, we chose two projects out of a total of 20 submissions, I would say, that we received from industry for support.

We are supporting these two products in 1989, at a total dollar value on the order of $.5 million. That is balanced by the industry contribution of another $.5 million, so there is a total of $1 million going into those two projects.

Our out-year commitment on those two projects is about another $600,000. Now, that is a relatively——

Senator FORD. The out-year, when you say out-year, how long is out-years?

Mr. STREB. The following year.

Senator FORD. Just one year, one additional year?

Mr. STREB. The two projects that we are committed to, at the moment, in the area of casting, are relatively modest in comparison to some of the other projects that we have within the Metals Initiative.

That is correct, Mr. Chairman.

Senator FORD. You are talking about 500,000 out of $30 million you just mentioned previously. Where is the other 29.5 million going?

Mr. STREB. The $30 million I mentioned, previously, had to do with one specific project, which was a multi-year project, that is over a period of four or five years. To give you a frame of reference, the Senate Interior appropriation for 1990, for the Metals Initiative, is on the order of $16 million. Now, that is yet to be worked out with the House, which is a little bit less.

And, as a matter of fact, I think that there is a $1 million difference between the two.

Senator FORD. I know, but what I am saying, what is that project?

Mr. STREB. That particular project, the one I referred to as a total multi-year commitment of $30 million, is in the area of direct reduction of iron. It is within the Metals Initiative, which is a very broad charter that we have that deals with any technology associated with metals, and it could encompass the casting technologies that we are addressing at this hearing today.

Senator FORD. You said it could address. It could address.

Mr. STREB. It could.

Senator FORD. That does not mean it is going to, does it?

Mr. STREB. There is funding available, within the 1990 appropriation over and above the amount which is necessary to satisfy the out-year mortgages on contracts that we already have in place.

As a matter of fact, that number happens to be $4 million, which is being set aside for new projects to be proposed by the industry.

Senator FORD. That is provided if they are approved.

Mr. STREB. Correct.

Senator FORD. Well, let me ask you then, why is the National Science Foundation, a better group to handle the centers than the DOE?

Mr. STREB. The Department of Energy certainly is capable of handling the centers. We have a different mode of operation than the National Science Foundation. The National Science Foundation is more oriented towards supporting activities within academia and the centers typically are located in an academic institution.

From the standpoint of experience, I would have to say that the National Science Foundation, probably, is more experienced than is the Department of Energy. But we are certainly capable of operating a center, if that were considered to be the best way of going. But I get back to the point that we, we think that a better way of using the funds is for a focused research activity toward an objective that we are concerned with; we have very specific objectives.

National Science Foundation's objectives are not quite so specific. But there are very specific objectives, and we feel that the approach that we take better serves that need than does the establishment of centers without any specific objectives.

Senator FORD. What about establishing a center, and having that academic institution be the overseer, and then select another center, or a couple of other centers, as it is related on this bill, and let them be directly responsible to you. What is wrong with that?

Mr. STREB. I think that if there were an existing center, and it were to collaborate, let us say, with industry to form a consortia of some sort to perform a given piece of research, leading to a very specific objective, we would certainly consider that seriously, and might possibly support it under the Metals Initiative.

However, at the point where that——

Senator FORD. I think I ought to get you to stop right there, Mr. Secretary, because you said you might well support it. And I do not want you to go explaining why you may not. That is like when Harry Truman said he wanted a one-handed economist. On the one hand it may bring this, but on the other hand it may do that. He just wanted a one-armed economist.

So I want to get you to stop there, where you say, you might well support it. I recognize the distinguished senior Senator from Alabama, who was the original cosponsor of this legislation, I am very pleased that he is here today. And I call upon him now for any statement he may want to make, and any questions he might have of you.

Senator Heflin.

STATEMENT OF HON. HOWELL T. HEFLIN, U.S. SENATOR FROM ALABAMA

Senator HEFLIN. Thank you, Mr. Chairman.

I want to thank you for expeditiously calling these hearings, and getting this legislation introduced by Senator Shelby started.

I think you have certainly moved about as fast as any chairman that I know of in any subcommittee in getting the hearing very shortly after we requested it.

I have an opening statement, but rather than reading it, I will ask that it be made a part of the record.

Senator FORD. Your statement will be included in the record.

[The prepared statement of Senator Heflin follows:]

OPENING REMARKS OF SENATOR HOWELL HEFLIN ON S. 775, BEFORE THE SUBCOMMITTEE ON ENERGY RESEARCH AND DEVELOPMENT OF THE SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES

THURSDAY, SEPTEMBER 21, 1989

MR. CHAIRMAN:

THANK YOU FOR YOUR VERY PROMPT RESPONSE TO MY REQUEST TO SCHEDULE THIS HEARING ON S. 775. IF THE ENTIRE SENATE WERE TO FUNCTION AS QUICKLY, SMOOTHLY, AND EFFICIENTLY AS YOU RESPONDED TO MY REQUEST FOR A HEARING ON THIS BILL, THEN THE U. S. SENATE WOULD NO LONGER ENJOY ITS PRESENT REPUTATION OF BEING THE MOST DELIBERATIVE BODY IN THE WHOLE WORLD.

MR. CHAIRMAN, I AM DELIGHTED TO BE A COSPONSOR OF S. 775, A BILL TO ESTABLISH THREE CENTERS FOR METAL CASTING COMPETITIVENESS RESEARCH. IT WAS INTRODUCED HERE IN THE SENATE ON APRIL 13,1989, BY SENATOR SHELBY, THE DISTINGUISHED JUNIOR SENATOR FROM THE GREAT STATE OF ALABAMA. WE ARE DELIGHTED TO HAVE HIM AT THIS HEARING AS OUR LEAD WITNESS. WE ARE ALSO DELIGHTED TO HAVE DR. THOMAS S. PIWONKA, DIRECTOR OF THE METAL CASTING TECHNOLOGY CENTER, UNIVERSITY OF ALABAMA, IN TUSCALOOSA. WE ARE EQUALLY PLEASED TO HAVE THE OTHER FOUR WITNESSES HERE WHO ARE GOING TO PRESENT LIVE TESTIMONY ON THIS LEGISLATION.

MR. CHAIRMAN, METAL CASTING RESEARCH IN AMERICA HAS DECLINED DRASTICALLY. THE U.S.A. IS NO LONGER THE GLOBAL LEADER IN FOUNDRY TECHNOLOGY. IF FACT, AMERICAN UNIVERSITIES, GENERALLY, ARE ABANDONING FOUNDRY EDUCATION. HOWEVER, I AM VERY PROUD TO SAY THAT THE UNIVERSITY OF ALABAMA HAS DONE JUST THE OPPOSITE. IT HAS ESTABLISHED A METAL CASTING TECHNOLOGY CENTER AS AN INTERDISCIPLINARY EFFORT WITHIN THE COLLEGE OF ENGINEERING. I WISH TO POINT OUT, MR. CHAIRMAN, THAT THE UNIVERSITY OF ALABAMA HAS A LONG TRADITION OF TEACHING AND RESEARCH IN THE AREA OF METAL CASTING.

THERE ARE NEARLY 100 FOUNDRIES IN THE STATE OF ALABAMA ALONE, MOST OF WHICH ARE SMALL, FAMILY-OWNED BUSINESSES. THEY PRODUCE OVER $1 BILLION WORTH OF CAST PRODUCTS EVERY YEAR, WITH ALL CASTING TECHNOLOGIES REPRESENTED AMONG ITS FOUNDRIES.

MR. CHAIRMAN, VIRTUALLY EVERY METAL MANUFACTURED PRODUCT IMPORTED INTO OR EXPORTED FROM THE UNITED STATES REQUIRES CASTINGS IN ITS ASSEMBLY OR MANUFACTURE. THE CASTING OF METALS IS PERFORMED BY THE FOUNDRY INDUSTRY. THE INDUSTRY CONTAINS OVER 4,000 PRODUCERS WITH SOME 300,000 EMPLOYEES. THE INDUSTRY, GENERALLY, PRODUCES PRODUCTS, USING OVER 11 MILLION TONS OF CAST METALS, WITH A VOLUME OF MORE THAN $20 BILLION.

INTERNATIONAL COMPETITION HAS FORCED A SIGNIFICANT DECLINE IN THE DOMESTIC INDUSTRY. FOREIGN FOUNDRIES ARE MORE COMPETITIVE BECAUSE OF IMPROVED TECHNOLOGY CREATED BY THE CENTRALIZED RESEARCH ACTIVITIES FUNDED BY THEIR GOVERNMENTS.

THUS, AMERICAN FEDERAL SUPPORT OF UNIVERSITY-BASED CENTERS FOR METAL CASTING COMPETITIVENESS RESEARCH WOULD PROVIDE KNOWLEDGE FOR ALL AMERICAN METAL CASTERS, CREATE A SUPPLY OF TRAINED FOUNDRY ENGINEERS, AND BENEFIT ALL AMERICAN INDUSTRIES AND WORKERS. IT WOULD BE AN INVESTMENT IN AMERICA'S COMPETITIVENESS, WHICH WOULD PAY BACK THE GOVERNMENT IN INCREASED TAX REVENUES.

THE BILL BEFORE US TODAY, S. 775, WOULD REQUIRE THE SECRETARY OF THE DEPARTMENT OF ENERGY TO ESTABLISH THREE ENTERS FOR METAL CASTING COMPETITIVENESS RESEARCH. THE RESEARCH WOULD FOCUS DIRECTLY ON ISSUES RELATED TO IMPROVING METAL CASTING TECHNIQUES. SOME OF THESE ISSUES WOULD INCLUDE: (1) WAYS TO MAKE NEW MOLDS FOR MORE ACCURATE CASTINGS; (2) MORE EFFICIENT WAYS TO MELT METAL AND CONSERVE ENERGY; (3) IMPROVED COMPUTER DESIGN TECHNIQUES; AND (4) BETTER WAYS TO TREAT WASTES.

MR. CHAIRMAN, I HOPE THAT OUR SUBCOMMITTEE WILL STRONGLY RECOMMEND S. 775 TO THE FULL COMMITTEE TO BE REPORTED FAVORABLY AND PLACED ON THE SENATE CALENDAR FOR IMMEDIATE FLOOR ACTION.

24-851 0 - 89 - 2

Senator HEFLIN. How much university academia research grants in the field of cast metals has the Department of Energy contracted for in the last 10 years?

Mr. STREB. A ball-park figure, is roughly 9 percent of the total budget for conservation, and I think that would probably apply to the whole conservation R&D program, I think that would hold for anything that we do in the metals area, for example, for fiscal year 1989, about 7 percent goes to academia, that is for research work, which is actually conducted at academia.

The balance of it is divided between industrial research actually performed by industrial research organizations and national laboratories.

Senator HEFLIN. I ask you about cast metals. How much has been devoted to cast metals?

Mr. STREB. We have through the years supported from time to time, work that relates to casting. For example, for work in cupola technology. We are supporting some work in cupola technology right now.

I would speculate that it is probably a relatively small part of the total amount which is spent in the metals industry overall. But the reason for that is we are the Department of Energy. We are concerned with saving energy, number one; number two, American competitiveness.

But the casting industry represents only about a quarter of a quadrillion Btu's of energy use, whereas the whole metals industry represents about 3 quadrillion. So it is a very small fraction. And I believe that what we have spent is probably in a similar proportion.

Senator HEFLIN. Name one university that the Department of Energy has contracted with or given a grant pertaining to cast metals.

Mr. STREB. We are currently supporting work at M.I.T. in metal casting. We have, in fact, two separate agreements, one under the Metals Initiative, and one under our Conventional Program, we are supporting M.I.T. in work relating to casting.

Senator HEFLIN. Is that one that has been made in the last two months? I understand you made in the last three months, you made two financial assistance awards to support the research and the development in the field of metal casting. And that was after Senator Shelby introduced his bill. Prior to Senator Shelby introducing his bill, can you name us those that have received grants?

Mr. STREB. There were two awards made. I do not know what the timing was relative to Senator Shelby's bill—the solicitation for these programs occurred early in the fiscal year. The award probably was made recently. The one that you are referring to is shared between the American Foundrymen's Society, General Motors, M.I.T., University of Michigan and Modern Equipment.

Now prior to that, and under the metals initiative, we contracted with EG&G who works with M.I.T. as one of their co-researchers on another area of casting technology. And that occurred sometime back, I do not know the exact time.

Senator HEFLIN. During the last nine years, we have seen substantial cutbacks in basic research in this country. And members of Congress, many of them, feel that this has been a serious mistake.

There has been a big cutback pertaining to researchers in academia.

Do you support the basic idea that you ought to exclude academia, universities from research in the cast metal field?

Mr. STREB. No, sir. I think that academia has a very important role to play. We welcome the opportunity to work with academia, wherever that is the most appropriate way to perform the work.

Senator HEFLIN. I believe that is all for——

Senator FORD. Mr. Secretary, when you say, most appropriate, that is in the eye of the beholder, is it not?

Mr. STREB. I think it is a matter of creating a team who is best equipped to perform the research and development activity, but also to implement the fruits of that work. And, in general, I would have to admit that we favor an arrangement which would include academia, but also include the industrial beneficiary of the research activity, which is being supported.

Senator FORD. I have always found in my tenure here, 14 years going on 15 now, that when monies are given to academia for research, we find the so-called peer review group, and they make a decision, and they make the allocation of funding to various and sundry institutions of higher learning in academia. And also you find that all grants basically go to the same universities. When one would retire from this group, then they would replace with somebody of like thinking and we wind up with the same group of people and same group of universities doing all the research.

Would you deny that that is basically right—that basic research in this country as you relate it to being funded by the Federal Government go to mostly the same universities year after year?

Mr. STREB. Well, it may be, Mr. Chairman, but it certainly is not true of the program that I am responsible for managing. We do not do grants to universities or seldom do grants to universities or anyone else. Most of our work is targeted, once again to get back to that point, and the research organization or organizations which are chosen are those which, in our opinion, are the best equipped to do the work.

Senator FORD. How do you determine best equipped?

Mr. STREB. It is a matter of evaluating the relative merits of proposals submitted against a given solicitation.

Senator FORD. Now those major institutions that have been getting all the money from the Federal Government all along should be the lead in making the application, shouldn't they?

Mr. STREB. Well, that is possible, but again, within our industrial program, we favor submissions which are made by industry and——

Senator FORD. So industry makes the submission and they also submit the institution of academia in that submission for a proposal?

Mr. STREB. That is a typical arrangement, yes.

Senator FORD. Well, it bothers me some, because we have found that, at least I have found, that you are getting more and more into the Congress making designation of research monies to outside this small group that always seemed to get it. We find that we are not dispensing the grants and loans and projects to universities that are fully qualified, but have never been able to crack the good

old boys circle. And the good old boys circle extends into what you would basically want to approve when that industry comes together.

It is at M.I.T. or something like that. So sure, they are number one. But there are also a lot out there doing very well. I found out, in liver and stomach transplants, the University of Nebraska probably is as good as any, but you would not know that by looking at the publicity from this town in the health field.

So what I am concerned about here is that, once we set up these centers which I am very much for, I think that we are going to find that you are going to get some good research, some research that would be able to be applied in a short period of time on the floor, as the industry refers to it, from the research onto the floor, so that it can be used almost immediately.

I think that we will give you an opportunity to try to defeat this bill, if you feel very strongly about it, because you are going to be out there, and we are going to be looking at it. That is not a threat, I want you to know that, because I cannot threaten the administration, you know. It is just like, Daddy told me never to get into an argument with the person who buys his ink by the barrel, and you have only a fountain pen. But I think we are going to have a chance to, you are going to have a chance to visit this, because I think it is right.

Do you have any other statements you want to make?

Mr. STREB. No, sir.

Senator FORD. We appreciate your coming today, and we appreciate your position. We understand why, and we look forward to hopefully working something out with you that would be amenable to this piece of legislation, what we think is good for the industry and the country.

Mr. STREB. Thank you, Mr. Chairman.

Senator FORD. Thank you.

The next witness will be Thomas S. Piwonka from the University of Alabama. And Mr. Walter Kiplinger, vice-president government affairs, American Cast Metal Association, Washington.

If you two gentlemen would come forward. We would be delighted to hear your testimony. And I am sure that Senator Heflin is delighted to see the University of Alabama present here today to make his testimony.

Mr. Kiplinger, if you would like to proceed, we would be delighted to hear your testimony. If you have a full statement, we would be glad to put it in record. You can highlight it; it is your prerogative.

STATEMENT OF WALTER KIPLINGER, VICE PRESIDENT, GOVERNMENT AFFAIRS, AMERICAN CAST METALS ASSOCIATION

Mr. KIPLINGER. Yes, sir, I have submitted a statement for the record.

Senator FORD. It will be included in the record.

Mr. KIPLINGER. We are grateful to Senator Shelby for introducing the bill, and very grateful to you, Mr. Chairman, for holding these hearings.

I would just like to briefly profile this industry. Today, there are 3,700 surviving foundries producing 12 million tons of product, valued at $25 billion. The current operating capacity of our members is 75 percent. Now the industry itself is a sprawling industry with companies located in 48 states. There are few clear market leaders. They are larger than mom and pop shops, but they are considerably smaller than concerns with the national scope; 80 percent of the U.S. foundries employ less than a 100 persons, only 6 percent employ more than 250.

It is predominantly small business, highly fragmented and owner-operated. Foundries manufacture a wide variety of products called castings. And these castings are used in 90 percent of all manufactured products. The problem is that they are most often hidden as component parts, thus making identification of the industry rather difficult, as such products as brake drums and rotors, compressor housings, rail car components, gears, valves, pumps, propellers for aircraft carriers, the main battle tank, hall and turret and my wedding ring, just as an example.

The health of the industry is tied to the health of the end-use markets and also to the general state of the economy. We have had a severe shake-out in the last 10 years. In 1981 there were 4,400 foundries employing 400,000 production workers. Today, as previously stated, there are 3,700 foundries employing 216,000 workers. The main reasons for these closures have been foreign competition and cost associated with EPA and OSHA rule making.

We are now in the middle of a comparative recovery, but compared to what?—compared to several years ago. Recovery is due mainly to the cheaper dollar, but we view the cheaper dollar as somewhat transitory. The industry is highly capital intensive. Investment and productive equipment is necessary to remain in business. Like the mining industry, much of our equipment is self-destructing. Because of this requirement for large capital investment just to stay open, the foundry industry has limited funds available for research investment. A static profit situation is caused by vigorous domestic and foreign competition, by customer dictated profit squeezes, by increased material supplies and labor charges, environmental improvement equipment, and safety and health expenditures.

Foreign foundries on the other hand, enjoy widespread national assistance in applying new technologies. Singly or in small consortiums, we simply, by ourselves, cannot do the job that needs to be done to further the necessary technology for the industry. Should S. 775 receive favorable consideration and passage, the industry realizes that it must be a financial participant in the proposed research centers, and is prepared to do so.

Foundries will support any program that can give them a technological even feel or maybe an edge.

Thank you.

[The prepared statement of Mr. Kiplinger follows:]

Statement of Walter Kiplinger
American Cast Metals Association

Before the Subcommittee on Energy Research and Development
Committee on Energy and Natural Resources
United States Senate

September 21, 1989

Good afternoon.

I am Walter Kiplinger, vice president-government affairs of the American Cast Metals Association (ACMA) which represents those iron, steel and non-ferrous foundries throughout the United States, responsible for 65 percent of the castings tonnage produced today in this country.

I appear before you today in support of S. 775 which proposes the establishment of three Centers for Metal Casting Competitiveness Research.

Let me express our industry's appreciation to Senator Shelby for introducing S. 775 and to Senator Ford for holding these hearings.

INDUSTRY PROFILE

The U.S. metal casting industry is composed today of 3700 surviving foundries that manufacture metal products by means of the casting process. These foundries produce a large and diverse array of products (perhaps as many as 100,000 distinct products), ranging in size from very small artificial heart valves to propellors for aircraft carriers weighing more than 200 tons. Castings are sometimes used as produced, but more often are machined or heat treated and used as components of assembled products. The economic health of this basic industry, therefore, depends on the economic health of its many end users.

Total employment in the industry is 216,000 persons with eighty percent of U.S. foundries employing less than 100 persons and only six percent employing more than 250 persons. It is an industry made up of small businesses which are highly fragmented and owner operated.

But nonetheless, the industry annually produces castings with a value exceeding $25 billion.

The heaviest foundry concentrations are in the Great Lakes, West Coast and Southeast. Leading foundry states are California, Pennsylvania, Wisconsin, Michigan, Illinois, Iowa and Ohio.

While most foundries carry a low profile -- because of this component product usage -- the castings which they produce are involved in every other manufacturing process whether it be for energy, transportation, aerospace, appliances or national defense. The range of products cast staggers the imagination.

For instance, railroads roll on cast steel wheels supported by cast steel frames and bolsters. Autos are powered by an assembly of cast iron blocks, ductile iron crankshafts, cast aluminum pistons. Planes are propelled by jet engines containing cast alloy buckets, vanes, turbine wheels. Your home contains more than a ton of cast pipe, bathtubs, sinks, fixtures, hardware, furnace and air conditioning parts. Your food is planted and harvested by tractors and implements loaded with cast components. Textile machinery is primarily an assembly of castings. When you play, it's with cast golf clubs, catcher's masks, musical instrument keys, piano backs, marine hardware, air-cooled motors, and the list goes on. Practically nothing happens without a castings.

A healthy foundry industry is essential for national defense because castings are vital to military equipment and weapons components. Approximately ten percent of

foundry industry output is used for national defense application annually. Examples of Army products reliant on castings are tanks, trucks, and artillery. The Navy utilizes castings in submarines for critical hull and machinery applications, such as diving, propulsion and weapons handling systems. Navy surface ships also require castings in their hull, power, and armament systems. Aircraft in all servies use castings in the fuselage as well as in engine accessories. Castings use is also found in missiles, bombs, and small arms components.

Cast products are literally the front end and foundation of America's industrial prowess. The quality (specifically, the mechanical properties and the dimensional accuracy) of castings affects the manufacturing costs of all of the products made in America which contain castings. Thus the ability of our industry to develop techniques to make castings with a higher value than we do at present impacts on the competitiveness of virtually all of American industry.

Similarly, the quality of castings made in foreign countries impacts not only their own market share of the global metal casting market, but also the ability of their finished goods industries to compete with those of the U.S.

In order to compete effectively in today's international markets, we must have the very best in technology, and we cannot be late in acquiring it. If we are late, the country which develops and implements it will take markets from us, and deprive American workers of the opportunity to make products. The purpose of S. 775 is to give our foundries a better opportunity to develop this technology here in the United States, where it will be used by American foundries, with the benefits passed on to their customers to, in turn, be passed on to American consumers.

Historically associated with the "Rust Belt" because of its metal pouring nature, the foundry industry is not recognized as the high tech industry which it actually is. The complexities of the metal casting process demand application of such diverse disciplines as:

heat flow	fluid flow
solidification physics	computer science
thermodynamics	alloy design
enviromental science	machine design
stress analysis	colloid chemistry

Energy is a major component of the cost of production of cast metal products. The American Foundrymen's Society has estimated that 15% of a casting's cost is represented by energy. In 1988 the industry used 253.6 trillion BTU's of energy at a cost of $3.3 billion dollars. Energy conservation is just one of many opportunities for research for cost reduction in the cast metals industry.

FOREIGN COMPETITION

The U.S. foundry industry has gone through an intense shakeout in the last decade. Hundreds of foundry closures characterized this period. From 1980 to 1985 enormous quantities of low cost ferrous and nonferrous castings flooded the U.S. market and threatened the very foundation of the domestic foundry industry. They came in as rough parts, machined parts, portions of assemblies and simply unclassified because of umbrella tariff categories.

Foundries during this period were victims of the "targeted industry strategy" that the Japanese modeled so effectively and that the Indians, Mexicans, Brazilians, Taiwanese, Germans, Spanish and Chinese carry on so effectively.

A "Competitive Assessment" study of this industry ordered by the U.S. Trade Representative and conducted by the International Trade Commission documented these facts.

It should be noted that at the time of intense import penetration the imports were coming from countries which had a clear understanding that a strong foundry industry is the front end of a strong industrial society.

Nationally funded metal casting programs are common in foreign countries which recognize that research and development contribute directly to lower cost production techniques, hence lower cost castings.

A primary purpose of S. 775 is the removal of these R&D advantages which foreign foundries enjoy.

FINANCIAL STRUCTURE

Due to continuous market pressures, the foundry industry is characterized by a modest return on sales and investments.

High profit margins are arrested by a static profit situation caused by vigorous domestic and foreign competition; customer-dictated profit squeezes; increased material, supplies and labor charges; environmental improvement equipment and fees; and safety and health equipment expenditures and programs.

It should be noted that foundries operate at the bottom of the "mark-up" chain. Castings start the mark-up process as they pass from the foundry through the machining and assembly operations on their way to the final buyers.

The industry, by its very nature, is highly capital intensive. Investment in productive equipment is necessary to remain in business. Because of this requirement for large capital investment just to stay open, the foundry industry has had limited funds available for research investment.

However, should S. 775 receive favorable consideration and passage, the industry realizes it must be a co-partner and/or financial participant in the proposed research centers.

THE NEED

Foreign foundries enjoy wide-spread, national assistance in applying new technologies, equipment, processes and controls to keep them internationally competitive in quality and in cost.

Others have echoed these same sentiments:

* In its 1988 report on Manufacturing Technology the Bureau of the Census quoted views expressed in the Report of the President's Commission on Industrial Competitiveness: "Perhaps the most glaring deficiency in America's technological capabilities has been our failure to devote enough attention to manufacturing or 'process' technology."

* The Wall Street Journal's Centennial Edition on June 23 of this year made the point that "Nowhere is the waning of U.S. global economic influence more apparent than in the field of manufacturing. Indeed, talk of the coming "Pacific Century" stems in large measure from the ability of Japan and other Asian nations to produce high quality goods more efficiently than anybody else -- especially the U.S. U.S. Manufacturers are at a disadvantage, some authorities contend, because they lack the government backing for research and development and training that Japanese and European companies receive."

* Former Defense Secretary Frank Carlucci, in his Annual Report to Congress stated: "The nation's economic well-being and our ability to defend ourselves depends, to a great extent, on the strength and vitality of our industrial base. We must sustain our commitment if we are to maintain the industrial infrastructure necessary to support our fighting forces worldwide, both in peace and in war."

* And Commerce Secretary Robert Mosbacher last January declared: "A central challenge facing the Department of Commerce is to support U.S. economic growth and international competitiveness. To meet this challenge, we must promote a better climate for increased U.S. exports, help American industry develop and apply new commercial technologies that will make us more competitive, and provide statistical data and information to meet the needs of the business and scientific communities."

CONCLUSION

This is the first time that the U.S. foundry industry collectively -- as an industry -- has sought any form of government assistance. We have been a traditional "do-it-yourself" industry. But times change, the world changes, and to meet this challenge of change we seek assistance similar to the assistance enjoyed by our competition.

The technological explosion has been a tremendous force for change producing, as it has, about 90% of all scientific knowledge in the last 30 years.

Rapid, technological change within any industry is accompanied by the demand for skilled personnel. The foundry industry is no exception. Engineers, chemists, metallurgists, technicians and craftsmen of all types are needed throughout the industry. This demand will continue for years to come. The automation of equipment, new processes and the stringent requirements for castings to perform even more difficult tasks poses a tremendous opportunity and a tremendous challenge.

Improved metal casting technology will have a ripple effect throughout our economy. As our castings improve, so that they require fewer manufacturing operations to be assembled into finished products, the manufacturing costs of our customers, the finished goods makers, go down. This makes them more competitive in America and the world market. In turn, this preserves and creates jobs, not only for foundry employees, but for all workers employed in manufacturing industries.

In turn, the employment provided by the increased competitiveness resulting from better casting technology will bring higher revenues to the federal government in the form of payroll taxes, thus helping to balance the federal budget.

We do not view this legislation as a handout to the foundry industry. It is an investment in the productivity and competitiveness of all American industry. It removes an advantage that foreign foundries whose research costs are paid by their governments have over us (and does so without involving tariffs or trade policy.)

In conclusion, the U.S. foundry industry believes that the concept of metal casting research centers as proposed in S. 775 would indeed increase our competitive ability and help us regain our competitive advantage in the global market place.

Singly or in small consortiums we cannot accomplish by ourselves the job that needs to be done to further the necessary technology in the metal casting process for foundries in the United States.

Senator FORD. Thank you, Mr. Kiplinger.

Doctor, do you wish to proceed with your statement, the same procedure. If you want your total statement included in the record, it will be. And you can highlight it however you wish.

STATEMENT OF DR. THOMAS S. PIWONKA, DIRECTOR, METAL CASTING TECHNOLOGY CENTER, THE UNIVERSITY OF ALABAMA

Dr. PIWONKA. Thank you very much, Senator.

I appreciate the opportunity to testify. My written testimony has been submitted to the record, and I would like to summarize it briefly here.

Senator FORD. Without objection, your total statement will be included in the record.

Dr. PIWONKA. Thank you.

This legislation is designed to benefit not only foundries, but all American industry. This is because, as we have heard, metal casting is the very foundation of our American manufacturing industry. Virtually every product made contains castings. And so as our castings become better and less expensive to produce, the products that are made with those castings, the computers, the automobiles, the aircraft, the farm implements, the appliances and so forth, they too become better and less expensive to make. Thus, this legislation, which focuses on improving the technology of the foundry industry, affects our entire economy, making it and our country stronger.

Metal casting is a high technology industry, but it masquerades as a smokestack industry. Although the concept of making a casting sounds deceptively simple, all you have to do is melt metal, pour it in a mold, and wait for it to solidify, it involves an exceedingly sophisticated understanding of physics and chemistry and mathematics. The metal caster must contend with complex material systems, which are undergoing phase transformations at high temperatures, and must control these systems and their phase changes precisely to produce a satisfactory product.

In addition, the industry must use energy wisely and recycle or dispose of waste with care. The research needs in this high technology industry are many and interdisciplinary. Today's most sophisticated technological tools must be used to solve them. For instance, one of the most important research problems that we have in the industry today, the prediction of how a casting will solidify, requires supercomputers to solve properly. So our high-tech industry needs good research in order to survive. And it also needs the trained men and women who understand this technology to operate our foundries.

Unfortunately, the universities which have been the source of most of the metal casting research in this industry and are responsible for educating the metal casters of the future, have, in the last decade, been abandoning the field of metal casting. And the reason for this is very simple. There is very little funding available for metal casting research. And as college professors earn their promotions based on the research they do, there are not any funds for metal casting research, so professors must look to other fields where funds are available.

This situation must be reversed if our foundry industry and our economy is to be internationally competitive. The foundry industry finds it particularly difficult to raise the funds required to support university research at the level which this high technology industry needs. This is not because metal casters do not care about advanced technology. Indeed, our industry has one of the best educational systems of any American industry and emphasizes the importance of technology transfer, that is, getting the technology onto the foundry floor, as you mentioned, Senator, as quickly as possible. However, it is an industry of small businesses, not large businesses. It is highly competitive, with much of the competition coming from overseas, and it does not generate large profits which can be plowed back into research.

Foreign foundries, however, are not faced with the same problem as their governments, which recognize the importance of the foundry industry to their manufacturing competitiveness, and recognize the importance of technology in sustaining a strong foundry industry, fund foundry research centers.

The work done at these centers is first rate, and is used to give their foundries a significant competitive advantage over our foundries. The countries whose foundries are most aggressive in competing for the American casting market, countries like Brazil, India, Korea and Germany, operate outstanding government-funded metal casting centers. What kind of benefits can the industry and their customers, meaning American industry, expect from the establishment of these centers? I think very significant ones.

For instance, these centers can be expected to lead in the development of methods of making lower cost, higher quality castings, resulting in substantial manufacturing, as well as energy and natural resource savings. We have one recent example showing a savings at the finished product of 50 percent in manufacturing cost. Since these savings are passed along to our customers, our customers can become more competitive internationally. The centers will perform focused research on programs which have been selected by industry, and can also be expected to develop great breakthrough technology, so that our castings possess properties which no other material can duplicate. And a striking example of the competitive advantage that superior casting technology can provide an industry, is found in the aircraft gas turbine industry.

As you know, our aircraft gas turbine industry are the world's leaders, and a lot of that is due to a foundry development, the single crystal casting, which has made our jet engines more fuel efficient than others.

And I would suggest, think what we could do for our automobile industry if we could duplicate that feat in an automobile casting. Our industry needs to be able to compete on an equal footing with foundries in other countries. To do so, we need to level the knowledge playing field, and this bill allows us to do just that. And at the same time encourage universities to get back into the metal casting field.

The proposed legislation is an investment in the future competitiveness of our country. It will pay dividends for all Americans. I

believe it is urgently needed, and I hope that you will take favorable action on it in this session.

Thank you very much. And I will be happy to answer any questions you may have.

[The prepared statement of Dr. Piwonka follows:]

STATEMENT

of

THOMAS S. PIWONKA

IN SUPPORT OF S. 775

A Bill to Establish three Center for
Metal Casting Competitiveness Research

BEFORE THE
SUBCOMMITTEE ON ENERGY RESEARCH AND DEVELOPMENT
of the
COMMITTEE ON ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

September 21, 1989

THOMAS S. PIWONKA, Sc. D.
DIRECTOR, METAL CASTING TECHNOLOGY CENTER
THE UNIVERSITY OF ALABAMA
TUSCALOOSA, ALABAMA
205/348-1589

Mr. Chairman:

I am here today to testify in support of S.775. I would like to mention the fact that both Senators from Alabama have joined in introducing this legislation. We are very pleased to find widespread support in the Congress for addressing the research and development problems facing the Nation's foundry industry.

The bill which is the subject of this hearing is vitally important, not just to the metalcasting industry, but also to all of American industry. As you know, this bill proposes the creation of three university-based metalcasting centers to conduct research and to educate young men and women for positions of technical leadership in our domestic metalcasting industry.

The need for the bill can be summed up very briefly:

1. The metalcasting industry is the foundation of a strong manufacturing economy.

2. Metalcasting is a high technology industry.

3. High tech industries need research to survive.

4. The present level of American metalcasting research is inadequate.

5. Metalcasting research in other countries is supported by their governments.

6. Our metalcasting industry needs the same support if we are to compete effectively in today's world market.

Metalcasting research in this country has declined in the last decade to the point where we have been unable to preserve the international lead in foundry technology which we once had, and which we need today to stay competitive in a world market. While present currency markets have "leveled the playing field" and allowed us to regain some of the casting and manufacturing business we lost earlier in the decade, both the foundry industry and its customers remain vulnerable to a recurrence of the economic difficulties which our entire country faced earlier in this decade. We now need to level the knowledge playing field.

Metalcasting is the foundation of a strong economy. Castings are found in virtually every product imported into or exported from this country. If our nation's industries are to recover the international lead in manufacturing and technology we once enjoyed, a strong and vital metalcasting industry will be required to support them.

S. 775 is designed to help revitalize the foundry industry, so that it can support the resurgence of the American economy. I would like to explain why. To understand the promise of this legislation, it is necessary to understand the technology involved in making a metal casting, and why it is necessary and important to carry out extensive research in the area. And it is also important to understand the situation which the industry faces in finding

funds for research, and the problem faced by universities desiring to specialize in foundry research.

- Foundry Technology -

First, let me correct the common misconception that metal casting is a low-technology, smokestack industry, with a tiny technology content. Nothing could be further from the truth.

Foundries have been an integral and necessary part of modern industrial society since the early 18th century. However, the technology is so complex that the art and skill of the craftsmen who made the castings became the governing factors in determining the success of a foundry.

But art and craftsmanship alone are no longer enough to produce modern castings. The immense complexities of the metal casting process are being analyzed. We are learning how to make sound castings, how to control their metallurgical structure and their properties, and how to control their dimensions to tolerances which were undreamed of fifty years ago.

The technology involved in making a metal casting is among the most complex used in any industrial manufacturing process, although the basic concept is simple. Castings are made by melting metal and pouring it into a mold made of a refractory material such as sand, and allowing the metal to cool and solidify. Then the mold is removed, the plumbing

system which delivers the molten metal to the mold (which is termed the "gating system") is cut from the casting, and the casting is ready for the customer. In technological terms, it is the controlled phase transformation of a multi-component system.

Each of the steps involved in making a casting requires a sophisticated understanding of science and technology. For instance, the melting process involves more than merely heating the metal to its melting temperature. In addition, the exact chemistry of the molten metal must be obtained by adding alloying elements, or refining the melt to remove deleterious elements such as sulfur in iron and steel, or oxygen in brass, or hydrogen in aluminum alloys. The metal must be thoroughly mixed, without introducing oxygen, which forms refractory-like particles (think of them as tiny rocks) with the metal; if these rocks (which are called inclusions) get into the casting, they form areas of weakness which can cause the casting to fail prematurely in service.

The molds, which control the shape, dimensions and soundness of the cast products are also technically challenging. Most molds are made of sand, mixed with water and bentonite clay. Bentonite clays are extremely complex minerals, and little is understood about them. Bentonite has an unusual molecular structure: it can accommodate ions of a variety of elements, each of which changes its properties drastically.

Furthermore, bentonite can exchange these ions with other ions that may enter the molding process as impurities, without looking any different, or warning the metalcaster that there has been a change in the molding material.

If the dimensions and the surface finish of the casting can be properly controlled, the casting can be used without any further manufacturing operations. Such castings, called "net-shape" castings, are especially valuable, as they eliminate the manufacturing operations of machining and joining, which consume energy and scarce natural resources, thus reducing the cost of the finished product. While the foundry industry is making progress toward this ideal casting, there remains a long way to go.

Once the mold is made, the metal must be poured into it through the "gating system", which is formed in the mold. Proper design of this gating system is crucial to the success of the metalcasting process. Unfortunately, it is also one of the most challenging technical problems in any discipline in the world today.

Gating system design involves the solution of equations governing three dimensional non-steady state two phase fluid flow under conditions where the basic properties of the fluids (liquid metal and the oxide slag which forms on it during exposure to the air) change because they are cooling. Solutions to these equations (which are second order partial differential equations in three dimensions, and must be

coupled with the corresponding heat flow equations) require the use of computers to solve. At the present time, solutions which are accurate enough to be of use to metalcasters require supercomputers. We have a long way to go, however, before such solutions are practical in the foundry.

Once the metal is in the mold, its solidification must be controlled. Alloys do not solidify the way ice does, at a single temperature. Instead, they solidify over a range of temperatures. This means that a solidifying casting contains not only solid and liquid metal, but a region containing both solid and liquid intermixed, which has the consistency of mush. In this region, the local compositions of both the liquid and the solid are changing because of chemical processes which occur during solidification, and these local changes (which occur over dimensions of fractions of an inch) must be controlled, because they affect the casting properties.

Also during solidification the metal shrinks, because solid metal is more dense than liquid metal. This means that extra liquid metal must be fed to the area where solidification takes place. To do this, reservoirs of metal (called "risers" or "feeders") are placed at the edges of the casting. To be effective these must freeze last, and, the solidification pattern of the casting must be such that

solidification starts farthest from the feeders and freezes toward them.

If this does not happen, when the casting is solid, a hole will be found where solidification shrinkage was not fed. This hole will decrease the casting's properties, and most likely make it unusable. Prediction and proper arrangement of the heat flow which governs the freezing pattern is especially important if good castings are to be made; like the gating system design, this can be best done with computer programs. However, as mentioned above, at present these programs lack the ability to give accurate designs at a cost which is low enough to allow them to be used in production.

In some castings, however, just making the casting sound (i.e., free from holes) and of the correct dimensions is not enough. In addition, the number and shape of the individual crystals which make up the solid casting must also be controlled. An example is the single crystal turbine blades which power advanced gas turbine engines in today's commercial airliners and military aircraft.

Another example is cast iron, an ancient, valuable, but poorly understood material. In casting iron, virtually the same metal composition can yield four different cast materials (white iron, gray iron, compacted graphite iron, and ductile iron), depending on the form the carbon dissolved in the melt takes when it solidifies. The form of

the carbon is controlled by varying the melt treatment and freezing rate of the iron. The properties of each of these types of cast iron are vastly different, and the types of cast iron cannot be interchanged. Thus the iron founder must control the process precisely and economically, to produce a competitive product.

Another area of daunting technological need in the industry involves the treatment and disposal of waste products from the casting process. Note that the foundry industry recycles everything possible, and disposes only of those materials which can no longer be used. Because these contain metal ions which are toxic to humans, they are classified as hazardous wastes. However, the metal content is not high enough to be recovered economically, although it is too high to meet environmental standards. Economical technology to minimize the creation of these wastes and to treat them has not yet been developed.

- Interdisciplinary Research -

Thus the technology which metalcasters use everyday to make the products which are components of the items without which our society could not function is interdisciplinary. It

includes such diverse technical areas as:

heat flow	fluid flow
solidification physics	computer science
thermodynamics	electrodynamics
environmental science	alloy design
stress analysis	numerical analysis
clay chemistry	colloid chemistry
artificial intelligence	organic chemistry
computer aided design	... and many more.

These are not low tech. They are all demanding, and many are on the cutting edge of what today is called high technology. In the foundry they all must be applied daily, at the lowest possible costs.

In a technology this complex, solid basic research needs are many. These range from studies of the fundamentals of alloy solidification to the development of efficient computer codes that guide and allow casting engineers to optimize gating systems for maximum quality at lowest cost. There is a need to learn how to design molds for net shape casting, and to gain more control over the solidification process so that more efficient gating systems can be designed, thus minimizing the use of increasingly scarce metal and the energy to melt it.

We need to develop better ways of making molds, and we need to find new mold materials, so that more accurate castings

can be made, reaching the goal of net shape casting, while conserving our natural resources. We must have a better understanding of those phenomena which create defects in castings during solidification. We must find more efficient ways of melting so that our use of energy decreases. And we need to learn how to treat our wastes economically to recover and recycle them, and to render those not recoverable safe for the rest of society.

In short, this basic industry needs the research and development funding which is appropriate to the high technology which it employs daily, if it is to stay competitive in the world market.

- Universities and the Foundry Industry -

And it needs trained engineers. Here it is necessary to tell you what has happened to metalcasting research and education in America's colleges and universities over the past decade.

Foundries and metalcasting are out of favor at most American universities today. This is due to a variety of reasons. One is the desire of many universities to market their engineering departments as being exclusively involved with the latest in fashionable technology, such as superconductors, or structural ceramics or composites. Often this is at the expense of more traditional technologies, such as

steelmaking or metalcasting, even though the disciplines involved in these are equally advanced and challenging.

Another reason is that the funding available for university research in the foundry industry is not sufficient at the present time to support more than a very few investigators. Here it must be remembered that professors earn tenure, raises and promotions based on the amount of research they perform. Because their careers depend on doing research, if the funding in a particular area, such as metalcasting, is inadequate, college professors can't afford to stay in it.

Research is labor-intensive. The cost of a university research project which supports a graduate student is between $60,000 and $70,000 per year. It normally takes two years for a student to earn a Master's degree, and an additional two to three years for a doctorate. University research, while perhaps the best research bargain available today, is not cheap.

Because research funding for metal casting has been scarce in the last decade, universities, with few exceptions (Alabama is one), have been discouraging their professors from working in this field. One by one, schools which used to be foundry centers have dropped their programs, or converted them to programs in the more fashionable field of solidification. These schools include MIT, Case Western Reserve, Penn State, and Texas A&M. Other schools have de-

emphasized the subject, shortened the course work, and removed metalcasting from their graduate programs.

I firmly believe that the schools which have de-emphasized foundry research have made a serious mistake. Even with the development of "new, high-tech" materials, such as superconducters and composites (many of which are made as castings), metal castings will continue to play a major role in our society. The foundry industry will continue to require bright and talented young men and women to guide its technology. And it will continue to be a cornerstone of America's industrial capability.

The results of this flight from the foundry industry by higher education are seen in the statistics from the Foundry Educational Foundation. This is an industry foundation which raises money for college scholarships for students interested in making a career in metalcasting. The foundation works exclusively with universities which have metalcasting courses. Over the last ten years, the number of Foundation schools has decreased from 37 to 30 schools, and the number of scholarships has decreased from 700 to 400 students. It appears that these numbers will drop further in the next few years.

Thus, at a time when the foundry industry's customers have become increasingly demanding, and our international competitors increasingly active, our research and development efforts have declined, and as a result, our main

24-851 0 - 89 - 3

source of R&D -- our universities -- are discontinuing the service, and discontinuing the education of the engineers our industry desperately needs. Our nation simply cannot allow this situation to continue.

Other countries, however, are moving rapidly to take advantage of our deficiency in metalcasting research. They understand the importance of funding the research which will bring their nations to prominence in the metalcasting field. Among these countries are:

France	West Germany
Belgium	Italy
Brazil	India
Korea	Australia
Canada	Austria

and many others.

The research which is done by these government-supported centers is of the highest quality. Let me give you two examples:

The first is from India. Last year Prof. R. Roshan, of the Indian Institute of Technology, told the annual meeting of the American Foundrymen's Society about an artificial intelligence program which his students had written to diagnose and correct causes of scrap in the foundry. This program is being used by foundries in India. India, by the way, is a country where castings are still poured in many

foundries by workers in their bare feet. But India now leads the United States in the development of this advanced technology because their government recognized the difference that having such technology could make in making their foundries internationally competitive, and funded the work.

The second is from Germany. Here the German government has funded investigators at the Foundry Institute of the Technical University of Aachen to develop a computer program to design the gating and feeding of castings. This European program is so well developed that the professors and graduate students who developed it are marketing it in Europe and are about to market it in the United States. No such technology is presently available in this country. What should be even more embarrassing to us is that they are offering to fund some American professors (who have not been able to obtain adequate funding in this country) to work on making some minor improvements to the program. In this area of high technology, where we should be leading, we are behind. We are confident, however, that if the Congress will support this legislation, we can once again regain our lead.

The metalcasting industry is a high tech industry which needs highly skilled engineers if it is to be competitive in the world. To train these engineers, universities need to be encouraged to get back into the metalcasting field. The purpose of this legislation is to encourage at least three

universities to specialize in the field and to develop centers of excellence in foundry science and engineering. Other universities may expect to benefit from this program by carrying out cooperative research programs with the designated universities.

- Foundries and Research -

If research and development is so important to the American metalcasting industry, why have they not provided the funds to keep foundry research at the forefront of university interest? The reasons lie in the structure of the American foundry industry.

The American metalcasting industry is an industry of small businesses, not large ones. There are 3700 foundries in the United States. Of these, only 22 have sales over $100 million annually. Eighty per cent of America's foundries employ fewer than 100 people. Not one of the independently-owned foundry organizations in our country is listed in Fortune magazine's list of the 500 largest industrial corporations in 1989 (to be listed, sales must exceed $500 million). So there are no giant American foundries which can be counted on to generate the research needed to keep this vital industry competitive.

Secondly, the products which foundries make are components of finished products, usually made by other companies, which are the customers of our foundries. As such, the castings

produced by foundries are at the beginning of the "mark-up chain" (a "value-added chain" is analogous to a food chain in nature). In other words, castings start at the bottom of the value added process as they pass through the machining, painting and assembly operations on their way to the final buyer.

There is vigorous competition in the metal casting industry (much of it from overseas foundries), which limits profit opportunity. Casting buyers also exert heavy pressure on foundries to keep casting prices low. So foundries do not generate large profits which can be invested in development of new technology.

The foundry industry is, by its very nature, is highly capital and energy intensive. Investment in productive equipment is necessary for the foundry to remain in business. Because of this requirement for large capital investment just to stay open, foundries have little money available for research investment.

In addition, the foundry industry is one which produces hazardous waste materials. A significant portion of the modern foundry's investment is thus required for pollution abatement and waste disposal. These environmental investments further compete for funds that might otherwise go for research and development. Note that environmental investments are, from the foundry's point of view, non-productive, although they are the price society charges (and

foundries willingly pay) to protect society from the environmental damage that unregulated metalcasting wastes might produce.

It is not that the foundry industry does not care about technology. On the contrary, the industry has one of the most active and effective systems of training and education to be found in any industry in the country. Each year thousands of American foundrymen are trained in industry-sponsored courses. Our industry recognizes the crucial importance of getting the latest in technology out to the shop floor where it can be used to create jobs and profits. The problem that we have, however, is that there simply isn't enough new technology being developed in this country, because the industry simply can't generate the profits needed to support the level of foundry research required today.

Foundries in other countries, even in those countries where investments in environmental, health, and safety are not required, have governments which substantially support foundry research and development. It is not surprising that foundries in such countries as Brazil, Korea and India are among the most active exporters of castings to this country -- as we have seen, their governments operate national metalcasting research centers for the specific purpose of making their foundries more competitive, i.e., able to take a larger share of the American casting market. And these

governments know that if their casting industries are strong, they will be the foundation of manufactured goods industries which will be able to compete with American manufactured goods industries and take jobs from American workers.

So it must be emphasized that the beneficiaries of the legislation being proposed are not merely the foundry industry and the three universities selected to be centers. All Americans will benefit, because castings go into all products manufactured in this country. As our castings improve in quality, as they approach and reach net shape, impressive savings in the manufacturing industries are possible. These savings are translated into better, less expensive, more competitive products made in America. And that means more American jobs, a better balance of payments, and more Americans working (which means a more prosperous country), and more revenue for the federal budget, as a result of more Americans working.

A particularly strong example the benefits which result from superiority in casting technology is found in the gas turbine engine industry. American foundries developed the technology to make single crystal castings. These castings allow the jet engines made with them to operate at higher temperatures than possible with conventional castings. As a result, the engines made by American manufacturers are more efficient than those made by other manufacturers, and the

American gas turbine industry leads the world--because in this one area, our foundry technology is superior to that of other countries. Think what we could accomplish if a similar situation were to develop in our automotive industry!

Very significant manufacturing savings can be expected from improved metalcasting technology. Let me give you four examples that were recently reported at the Fourth Annual Conference on Evaporative Pattern Casting, held in Chicago in June, 1989, and sponsored by the American Foundrymen's Society. The Evaporative Pattern Process is an American invention, which, although twenty-five years old, is just now beginning to be used in metalcasting production--here and abroad. It is illustrative of the magnitude of savings which can be realized from advanced casting technology.

The examples included a pump impeller, a hydraulic valve component, an exhaust manifold for a small engine, and a turbocharger turbine. For three of the castings, the cost savings for the finished product (after it had been machined) ranged from 35% to 50%, and the casting with the 50% savings also performed better and weighed less than the part it replaced. In the fourth case, the part could be made only by this process, which meant that the finished product could only be made as a result of this development in the science of metalcasting.

With this potential for improving the efficiency and productivity of American manufacturing, it is hard to conceive of a program which could have a greater impact on improving the competitiveness of American industry. It is an investment in our entire economy.

There is precedent for this type of investment in our country. Over one hundred years ago the Morrill act established land-grant colleges and the funding of agricultural research. At that time 95% of Americans were farmers. As a very direct result of the research that act has made possible over the decades, today only 3-5% of us are farmers, and our agricultural production is the envy of the world. In other words, federally-funded research programs work, it they are funded adequately over long enough periods.

I hope that my remarks have helped to clarify the high level of technology which is required today to be competitive in today's world market, and the technical problems which we must solve. The currency markets have leveled the playing field to some extent, but the field is hardly level when our foreign competitors have the benefit of research funded by their governments, and we do not. Other nations recognize the technology involved and the importance of a vital foundry industry to the economic health of their people, and are actively supporting research in their countries so that

their foundries can take business away from our foundries, and their finished goods manufacturers take business away from ours.

The proposed legislation is an investment in the competitiveness of not only the American foundry industry, but that of our customers, who use our products in their products. It will pay dividends for all Americans. Passage of this legislation is urgent, and I hope that you will take favorable action in this session of Congress. Thank you.

Senator FORD. Thank you very much, Doctor.

You gave a very fine statement. I want to yield to my good friend, Senator Heflin, for any questions that he might have of the two witnesses.

Senator Heflin.

Senator HEFLIN. Dr. Piwonka, the legislation calls for the establishment of three university-based centers for metal casting research and development. Why three centers?

Dr. PIWONKA. Well, I think that one of the things that is important in this concept, is the idea of getting the results onto the foundry floor as quickly as possible. If we have three centers that are geographically dispersed around the country, they are in much closer geographical contact with the foundries in that area, in those areas.

The American foundry industry does tend to cluster in geographical locations. And the foundries in those areas work reasonably closely with universities. And this is a way of cementing that relationship.

Senator HEFLIN. Would this bill duplicate the current DOE efforts under the Steel and Aluminum Conservation Act of 1988, and is the DOE program geared towards foundry research projects at the university level?

Dr. PIWONKA. That is an excellent question. And I think there would be—I think that we should differentiate between the two. We are very happy that the metals initiative bill exists. And I think the Department of Energy should be congratulated for recognizing that it can make some of the funding available in that bill, available to the metal casting industry. But the purpose of that bill was not to support the metal casting industry. The purpose of that bill was the primary metals industry, the steel and aluminum industry, and of course, that industry is much larger than the foundry industry and much better organized.

When it comes down to a one on one or a crunch for a competition between foundry projects and steel industry projects, I think the foundry industry does not expect to have a very high batting average. And we heard Mr. Streb indicate that out of 24 foundry-related proposals, only two were funded by the Department of Energy under that bill.

The other thing that I think we should point out, Senator, and you were, I think, alluding to it in the question that you asked Mr. Streb, was that that bill does nothing to encourage the universities to get back into the metal casting field. One of the programs, for instance, which they are presently funding, there is a total of around $425,000 available. But less than $50,000 of that has gone to universities. So these bills are really separate sorts of bills; S. 775 is focused with the foundry industry, and is looking at the problem of—addressing the problem of rekindling interest on the university level in metal casting research.

Senator HEFLIN. I sense a feeling that the Department of Energy, that they have been doing research, but they have been doing research basically with some industries within their certain fields, not too much in cast metals. But the concept of university research, integrated with industry research and separate from industry research, I think, historically, has proven itself.

Would you like to comment on the aspect of research generally by using university research as opposed to just industry or industry that has a weak university phase of research connected with it?

Dr. PIWONKA. Yes, I think that is a good point. We have in American industry, of course, what we call the 90-day horizon, the financial requirements that do not allow industry to focus on the long-term as much as many of them would like to. We in the universities, of course, can take a much longer view. And I should point out that this kind of research is engineering research, as divorced from the kind of research the National Science Foundation funds. And in that case, it is very important for us to be working very closely with industry. And the nice, two-way street here, the good part is that we learn more about what industry needs. And industry is able to put our brain power to work solving their problems. It is really a very good type of cooperative arrangement.

Senator HEFLIN. You called it a 90 day? I used to call that the pot-of-gold-at-the-end-of-the-rainbow approach.

Mr. Kiplinger, what general areas of technology should be included in a university-based research program that could be expected to help the American foundry industry today?

Mr. KIPLINGER. Senator, I am not a technician. I am going to have to defer that one to Dr. Piwonka.

Dr. PIWONKA. I think there are a number of them. One of them is what we call, net shape casting, where we would be able to make a casting which had the dimensions that would allow it to be used right in a final product. And an example would be the automobile engine block in your automobile. When we finish casting this particular—making this casting, it then goes to a machine line where we drill the holes and face off the ends and get the dimensions just so that they are just right.

If we were able to develop the technology so that we could use it as cast, we would of course eliminate entire manufacturing operation and the inventory that has to go with that. That is one of the areas.

Another area has to do with energy usages of the recycling and in the environmental issues, which are very important for this industry. Many of my foundrymen friends tell me that it may be the most important issue in the short term. What do they do to be responsible corporate citizens, and how can they manage the waste that they generate, in an economical and responsible manner at the same time?

Those are, I think, the two major areas right now.

Senator HEFLIN. I believe that is all.

Senator FORD. Fine, thank you, Senator.

I have only a couple of questions.

Mr. Kiplinger, Dr. Piwonka stated in his written testimony that many universities have quit doing metal casting research. How will simply establishing centers get universities to do casting research?

Mr. KIPLINGER. It would encourage the enrollment of students directed toward metallurgy.

Senator FORD. Is that all? Doctor, do you have anything to add to that?

Dr. PIWONKA. Well, it will certainly encourage the researchers to become interested in this. We have had a lot of—I think this is in-

teresting what has happened at the University of Alabama in particular, when we started our metal casting center two years ago, there was a moderate amount of metal casting funds available for research in the university. We have been able to interest a number of Alabama foundries in our work, and it has been very gratifying to me to see the interest that has come up in other engineering departments that had not previously even considered metal casting as something that they were interested in. And they are making some very substantial contributions to the technology of our industry.

You give them the opportunity and professors are very happy to put their brain power on the kinds of programs which are needed and for which there are funds made available.

Senator FORD. Well, let me see if I have this straight now. Mr. Kiplinger, you may be able to answer this, and I think you already have, that most of the foundries are of the size that are not financially able to fund research programs on their own. But, as I understood you to say, your association could assist the research programs if this piece of legislation is approved.

Mr. KIPLINGER. Yes, sir. We would, we would act—I hate to overuse the word—but we would act as a consortium with the other foundry trade associations in working out the mechanics of matching funds for this legislation. We do not expect it to come entirely from DOE or federal funding.

Senator FORD. So then, you would be the consortium that the Secretary mentioned earlier in this case to make the proposal to the Department of Energy?

Mr. KIPLINGER. As far as the funding goes, and also as far as the selection of research projects goes.

Senator FORD. Okay. Would a committee of representatives from segments of the industry directing the centers' research activities be a good idea?

Mr. KIPLINGER. Yes, definitely. Representatives of each segment of the foundry industry, of which there are about six, seven or eight different segments of the industry.

Senator FORD. There would not be a humongous group then. You would have six to eight members who would develop the types of research that would be required of the centers.

Mr. KIPLINGER. Approximately—not more than 10 persons, for sure.

Senator FORD. Do you have any idea how much these centers would cost?

Mr. KIPLINGER. We were thinking in the neighborhood, initially, of $3 million to $5 million per center. We do not know how realistic that would be within DOE's budget, but that was our original conceptual thought.

Senator FORD. When the Secretary was talking about $500,000 a year, matched by another $500,000, I think we are going to have to find the figures and the proposals to substantiate that kind of cost. And I think we can do that. Do you not?

Mr. KIPLINGER. Yes, sir.

Senator FORD. All right, gentlemen. I do thank you and appreciate it. We look forward to working with you.

Senator Heflin, I am sure will stay after us until we get this out of committee. I look forward to working with him.

Next is Mr. Orian Williams, assistant to the president at Glass, Molders, Pottery, Plastics & Allied Workers Union, from Hilliard, Ohio, and my friend, Ron D. Smith, president of Gamco Products Company from Henderson, Kentucky, on behalf of North American Die Casting Association. And he will be accompanied by Mr. Dereck L. Cocks, the technical director.

And Mr. Williams, if you want to proceed with your statement, we will be glad to take your total statement and place it in the record as if given; you can highlight it. It's up to you.

STATEMENT OF ORIAN WILLIAMS, ASSISTANT TO THE PRESIDENT, GLASS, MOLDERS, POTTERY & PLASTICS WORKERS UNION

Mr. WILLIAMS. Mr. Chairman, I have submitted a statement. I would like to highlight it at this time.

Senator FORD. That is fine. Your total statement will be included in the record.

Mr. WILLIAMS. Thank you, Mr. Chairman.

Thank you for inviting me here today to speak on behalf of the employees of the foundry industry in support of S.775. My name is Orian Williams. Currently, I serve as assistant to James E. Hatfield, President of the GMP, the Glass, Molders, Pottery, Plastic & Allied Workers Union.

This union was formed two years ago as a result of a merger between the Glass, Pottery, Plastics and Allied Workers and the International Molders and Allied Workers Unions. I had the pleasure and the privilege of serving as president of the Molders Union at the time of the merger. All together, I have spent almost 45 years of my career in the foundry and cast metals industry. I first went to work in a foundry in October of 1941, then spent a few years in the U.S. Navy, and returned to foundry work in 1946. In 1951 I became a union official and have served as such ever since.

The Molders Union was formed over 100 years ago and was one of the oldest industrial unions in the United States at the time of the merger. It and our current merged union, the GMP, have long represented the majority of the organized employees in the foundry industry. When our foundry industry was at its peak, our union had over 74,000 members. But through the '80s our industry fell on hard times as foreign castings penetrated the American markets and we saw over 1,000 foundries close and our membership fall to 33,000. This membership loss was a major reason we sought the merger with the Glass Workers.

The workers of the foundry industry recognize the need for a better program of research and development to help make our industry stronger and more competitive in the world market.

The foundry industry consists of mostly small, independent businesses by themselves, and cannot fund the kind of research and development needed to allow the industry to find technological solutions to solve the many safety, health and environmental problems that our industry has traditionally faced, while at the same time allowing us to make castings more productive with higher quality.

In addition, most of our foreign competitors are not governed by laws such as OSHA and EPA regulations. Just two months ago, OSHA issued new regulations regarding lead exposure in several metal industries. OSHA concluded a lower lead standard was feasible for all the industries, with the single exception of the nonferrous foundries that pour metals with lead content. The agency said it would not be economically feasible for the hundreds of small foundries, which are the heart of the nonferrous foundry industry, to meet the lower lead standards.

In their report, OSHA stated that, over the last 23 years, the number of nonferrous found brass and bronze foundries in the United States and Canada declined from 2,281 to 1,392.

Further, they estimated that 42 percent to 52 percent of all small foundries producing leaded alloys would go out of business if they had to meet the new lower standard. OSHA also said that, due to foreign competition, full pass-through of costs is not an option for this industry.

As a representative of foundry workers, I can say unequivocally, we want even stronger OSHA and EPA protections for our workers and their families. Yet, we have seen many of our foundries close, because they could not economically meet current regulations. And as we can see from this latest OSHA directive, many more would be forced to close if we do continue to push for stronger regulations.

So we are on the horns of a dilemma. For our union workers, we need economically strong foundries to provide the jobs we need with good wages and benefits. On the other hand, we want the foundries to continue to improve their work environment. It is our hope that funding through this proposed legislation will help get the research done that will allow the foundries to accomplish both of these objectives.

While ours is a most basic industry, it still involves highly complex processes that have continued to evolve and change over the years. Our workers make castings in almost every known metal to man. It is vital that more research be done in this country to keep foreign castings from overwhelming our American industry by making technological advancements that give them a competitive advantage. They already have enough advantage with lower pay rates, government subsidies and the aforementioned lack of environmental and safety controls.

Our union developed a strong industry support program in the glass bottle industry and stands ready to work with foundry management to develop such a program in the metal casting industry. And while we are proud of what our industry and our workers have accomplished over the years, and while we have always been self-reliant in solving our problems and getting the job done, we are no longer isolated from the competition of other nations, and subsidized industries. We need the government support that this bill, S.775, can give us to make our industry stronger and provide the kind of jobs our workers so richly deserve.

I want to thank Senator Richard Shelby of Alabama for introducing this legislation, and I also wish to express my appreciation, Mr.

Chairman, for holding these hearings, giving us a chance to explain why we feel this legislation is necessary for the benefit of our industry, its workers and our society as a whole.

Thank you.

[The prepared statement of Mr. Williams follows:]

STATEMENT

of the

GLASS, MOLDERS, POTTERY & PLASTICS WORKERS

IN SUPPORT OF S. 775

A Bill to Establish Three Centers for
Metal Casting Competitiveness Research

BEFORE THE
ENERGY RESEARCH AND DEVELOPMENT SUBCOMMITTEE
of the
ENERGY AND NATURAL RESOURCES COMMITTEE
of the
U.S. SENATE

September 21, 1989

ORIAN WILLIAMS
GLASS,POTTERY, PLASTICS & ALLIED WORKERS
608 EAST BALTIMORE PIKE, P.O. BOX 607
MEDIA, PA 19063

Thank you for inviting me here today to speak on behalf of the employees of the foundry industry in support of S. 775. My name is Orian Williams. Currently, I serve as special assistant to James E. Hatfield, President of the GMP, the Glass, Molders, Pottery, Plastic and Allied Workers Union.

This union was formed two years ago as a result of a merger between the Glass, Pottery, Plastics and Allied Workers and the International Molders and Allied Workers Unions. I had the pleasure and privilege of serving as President of the Molders Union at the time of the merger. Altogether I have spent almost 45 years of my career in the foundry and cast metals industry. I first went to work in a foundry in October of 1941, then spent a few years in the U.S. Navy, and returned to foundry work in 1946. In 1951 I became a union official and have served as such ever since.

The Molders Union was over 100 years old and was one of the oldest industrial unions in the United States at the time of the merger. It, and our current merged union, the GMP, have long represented the majority of organized employees in the foundry industry.

When our foundry industry was at its peak in the late seventies and early eighties, our union had over 74,000 members. But through the eighties our industry fell on hard times as foreign castings penetrated American markets and we saw over 1,000 foundries close and our membership fall to only 33,000. This membership loss was the major reason we sought the merger with the Glass Workers.

The workers of the foundry industry recognize the need for a better program of research and development to help make our industry stronger and more competitive in the world market.

Only with a technologically advanced industry can we hope to secure our jobs and provide our workers with a good solid standard of living keeping them in a position to contribute substantial payroll tax dollars helping local, state and the federal government to balance budgets and provide the services required across our nation.

The foundry industry consists of mostly small, independent businesses that by themselves cannot fund the kind of research and development needed to allow the industry to find technological solutions to solve the many safety, health and environmental problems that our industry has traditionally faced, while at the same time allowing us to make castings more productively with higher quality. In addition most of our foreign competitors are not governed by laws such as our OSHA and EPA regulations.

Just two months ago OSHA issued new regulations regarding lead exposure in several metals industries. OSHA concluded a lower lead standard was feasible for all the industries with the single exception of nonferrous foundries that pour metals with lead content. The agency said it would not be economically feasible for the hundreds of small foundries which are the heart of the nonferrous foundry industry to meet the new lower standard. In their report OSHA stated that over the

last twenty-three years, the number of nonferrous brass and bronze foundries in the U.S. and Canada had declined from 2,281 to 1,392. Further they estimated 42% to 57% of all small foundries producing leaded alloys would go out of business if they had to meet the new lower standard. OSHA also said that "due to foreign competition, full pass-through of costs is not an option for this industry."

As a representative of foundry workers, I can say unequivocably, we want even stronger OSHA and EPA protections for our workers and their families. Yet we have seen many of our foundries close because they could not economically meet current regulations and as we can see from this latest OSHA directive many more would be forced to close if we do continue to push for stronger regulations.

So we are on the horns of a dilemma. For our union workers we need economically strong foundries to provide the jobs we need with good wages and benefits. On the other hand we want the foundries to continue to improve their work environment. It is our hope that funding through this proposed legislation will help to get the research done that will allow foundries to accomplish both of these objectives.

As you have already heard, virtually all manufactured products made of metal contain castings of some kind so that when the foundry industry is unable to produce efficiently, the whole metal manufacturing industry suffers and ultimately the wage earner and consumer, our union members among them, are forced to pay more for products they need and want such as automobiles, appliances, medical

instruments, recreational equipment and many, many other items. Our union members lose in two ways. We suffer because our foundry industry is not as economically sound as it should be and as we would like it to be. We suffer as consumers who have to pay higher prices for the goods we purchase, and we can't get employee discounts because our employers do not manufacture finished goods but rather only components that go into the finished goods and are continually marked up as they go through the manufacturing process.

While ours is a most basic industry, it still involves highly complex processes that have continued to evolve and change over the years. Our workers make castings in almost every metal known to man. They make them in all kinds of sizes and shapes. It is vital that more research be done in this country to keep foreign castings from overwhelming our American industry by making technological advancements that give them a competitive advantage. They already have enough advantages with lower pay rates, government subsidies and the aforementioned lack of environmental and safety controls.

Foundry workers are strong men and women who have stood our country in good stead through past wars and hard times. We will continue to do that in the future, with the proper help and support from our government and our industry. Our union developed a strong industry support program in the glass bottle industry and stands ready to work with foundry management to develop such a program in the metal casting industry.

And while we are proud of what our industry and are workers have accomplished over the years, and while we have always been self-reliant in solving our problems and getting the job done, we are no longer isolated from the competition of other nations with subsidized industries. We need the government support that this bill, S. 775, can give us to make our industry stronger and provide the kind of jobs our workers so richly deserve.

My thanks to Senator Richard Shelby of Alabama for introducing this legislation. I also wish to express my appreciation to Chairman Wendell Ford for holding these hearings, giving us the chance to explain why we feel this legislation is necessary for the benefit of our industry and its workers and our society as a whole.

Senator FORD. Thank you, Mr. Williams.

Mr. Smith, would you like to make your statement? And get on with some questions then.

STATEMENT OF RONALD D. SMITH, PRESIDENT, GAMCO PRODUCTS COMPANY, ON BEHALF OF THE NORTH AMERICAN DIE CASTING ASSOCIATION, ACCOMPANIED BY DEREK COCKS, TECHNICAL DIRECTOR, THE NORTH AMERICAN DIE CASTING ASSOCIATION

Mr. SMITH. Chairman Ford, and members of the subcommittee, I am most pleased to be here today on behalf of the die cast industry and to testify in support of S.775 authored by Senator Shelby and cosponsored by Senator Heflin and other members of the Senate.

I want to take this opportunity to introduce Derek L. Cocks, the technical director for the North American Die Cast Association who has accompanied me here today. Mr. Cocks' written testimony provides important technical information, and I ask that it be submitted for the record.

Senator FORD. Without objection it will be included in the record.

Mr. SMITH. He will of course be available to respond to any questions you might have.

Die casters across the Nation know and understand that this issue is important to the continued competitiveness of our industry. As a result, NADCA and its members are playing an active role in supporting this bill, and urge our Senators to cosponsor S.775.

As a representative of the North American Die Cast Association and a constituent of yours, Chairman Ford, I want to thank you for taking this time to hold this meeting. We look forward to continuing to work with the subcommittee on this issue.

We recognize that the full scope of S. 775 involves the entire metal casting industry. However, we want to convey to you that the die cast is an important segment of the industry. Our industry is in particular need of the competitive and technological edge that this legislation offers. We want to ensure that any research that is ultimately done will benefit die casters.

The North American Die Casting Association is the trade association and professional industry of the die cast industry. Our $8 billion industry employs over 75,000 people across the Nation. NADCA members produce over two-thirds of all custom die castings produced in the United States. The metal casting industry is primarily comprised of small companies, many which are family owned and operated.

GAMCO Products, of which I am president, is a small- to medium-size company, which produces very high quality plumbing hardware, faucet parts, tub spouts and handles, and appliance parts through the die cast processing. Our plant is located in Henderson, Kentucky. We employ approximately 250 employees and have been in business on the same site for 30 years. We proudly claim to be an important part of the community as a source of employment and income contributing to the continuity of what we see as the American way of life.

In addition to this type of castings which my company makes, the die casting industry, encompasses a wide variety of products

that have a direct effect on the quality of American life. Examples range from door knobs and parts of the watch you are wearing to transmission housings and many other components in the car you drove today. Aircraft cabin components, computer chassis, disk drives, printer components, wave guides in microwave ovens and radio antennas, chain-saw parts, small engines for lawn mowers and boats, as well as aerospace components are all made by the die casting process.

The metal casting industry has become a highly technical industry. The die casting industry, in particular, is highly mechanized and automated, geared to high-quality production, which uses a wide spectrum of technical disciplines, including metallurgy, engineering and electronics. As stated, the industry is comprised of mainly small companies which owe most of their efficiency to their diversity. However, this necessarily results in the diffusion and fragmentation of research efforts. The North American spirit of competition between such small companies makes for an efficient industry with low manufacturing cost and high productivity, but conversely produces low profit margins.

The size of most companies and their low profit margins severely limit any individual company's ability to engage in necessary research and development. In the past few years, the die casting industry has found itself in competition not so much with its neighbors but worldwide. Our markets have become threatened, particularly by the Asiatic basin countries in the countries, which have the advantage of cheap labor and far less stringent environmental regulations. As a die caster and member of NADCA, I have traveled to the Far East and Europe on several occasions, evaluating our industry against their industry and our ability to compete.

It is a formidable task, indeed, to compete. We are confronted with labor cost, medical cost, workmen's compensation and other fringe benefit cost, just to mention a few obligations. In addition we must deal with the requirements of OSHA, EPA and those state agencies which are concerned with safety and environmental controls. Tooling cost, which is so necessary in our business, is also impacted by these same factors.

I have visited a wide variety of foreign die casting plants ranging from those with dirt floors in Korea, slightly better ones in Taiwan, to the modern plants in Europe and the ultramodern ones in Japan.

Japan and Europe have a lot of the same problems we have in competing in world markets against the Taiwanese, the Koreans and others. The one thing they do have going for them is, that their government is assisting them through research programs. Such research programs give them the ability to have the best technology and to effectively compete in the world market.

One example of foreign competition directly experienced by my own company, Gamco, occurred three years ago. We made a commercial refrigerator handle for the ARDCO company of Elkton, Kentucky, which is located 100 miles from our plant. Their annual orders on this part was 250,000 pieces with the selling price of over $2 per piece, a total of at least $500,000 in sales to us annually. We lost this job to a Taiwanese company because their price was 25

percent less than ours for a savings to ARDCO of $125,000 per year.

If we do not stay at the very top of automation and technology, and this can only be accomplished by research, this type of experience will no doubt continue and probably accelerate. During a visit to the Asian basin countries, we saw die casters which had been transferred from a U.S. manufacturer to a plant in Hong Kong. The plant itself was on the 20th floor of a high-rise apartment building. Liquid effluent was drained directly onto the ground underneath the highway ramp at the site of the building. Airborne emissions went through roof-mounted smokestacks. Operators wore no protective clothing, only T-shirts, pants and sandals. And machines were totally without safety guards. However, modern technology in the form of the latest design runners and feeds were being used to increase quality and production rates and to reduce metal melt.

The technology has been provided by an arrangement between the government-sponsored Hong Kong Productivities Council and the Zinc and Lead Asian Service based in Australia. Some of the technology had originated in the United States.

The only way we can stay competitive is to achieve a high degree of automation, and to set quality levels which cannot be met offshore. In addition, we need to strive for higher levels of productivity by reducing cycle times and eliminating extra operations such as labor intensive polishing and finishing in order to keep prices down.

The bottom line is that we need to use technology to combat cheap labor; and we need science that is available to foreign competition to satisfy our environmental constraints. We are already doing this with existing resources and NADCA is a vital part of this effort. But it is a race against time. We need a higher pace of research to develop new techniques and homegrown experts skilled in new technology to enable us to keep ahead. In short, we need centers of expertise specializing in die casting, such as those to be established by S.775.

Thank you once again for the opportunity to testify before you in support of the metal casting research bill.

Mr. Cocks and I would be pleased to respond to any questions you might have at this time.

[The prepared statements of Mr. Smith and Mr. Cocks follow:]

TESTIMONY OF

RONALD D. SMITH, PRESIDENT
GAMCO PRODUCTS COMPANY
HENDERSON, KENTUCKY

On Behalf of the
NORTH AMERICAN DIE CASTING ASSOCIATION

IN SUPPORT OF S. 775

A BILL TO ESTABLISH THREE CENTERS FOR
METAL CASTING COMPETITIVENESS RESEARCH

Before the

ENERGY RESEARCH AND DEVELOPMENT SUBCOMMITTEE OF THE
SENATE ENERGY AND NATURAL RESOURCES COMMITTEE

September 21, 1989

Chairman Ford and members of the subcommittee: I am most pleased to be here today on behalf of the die casting industry to testify in support of S. 775 authored by Senator Shelby and cosponsored by Senator Heflin and other members of the Senate.

I want to take this opportunity to introduce Derek L. Cocks, the Technical Director for the North American Die Casting Association (NADCA), who has accompanied me today. Mr. Cocks' written testimony provides important technical information, and I ask that it be submitted for the record. He will, of course, be available to respond to any questions you might have.

Die casters across our nation know and understand that this issue is important to the continued competitiveness of our industry. As a result, NADCA and its members are playing an active role in supporting this bill and urging our Senators to cosponsor S. 775. As a representative of the North American Die Casting Association and a constituent of yours, Chairman Ford, I want to thank you for taking the time to hold this hearing. We look forward to continuing to work with the subcommittee on this issue.

TRADE ASSOCIATION BACKGROUND

We recognize that the full scope of S. 775 involves the entire metal casting industry; however, we want to convey to you that die casting is an important segment of this industry. Our industry is in particular need of the competitive and technological edge this legislation offers. We want to ensure that any research that is ultimately done will benefit die casters.

2

The North American Die Casting Association (NADCA) is the trade association and professional society of the die casting industry. Our $8 billion industry employs over 75,000 people across the nation. NADCA members produce over two-thirds of all custom die castings produced in the United States.

NADCA membership consists of both corporate and individual members from over 750 companies located in every geographic region of the United States. These companies include custom die casters (who produce die castings for sale to others), captive die casters (who produce die castings for their own use in manufacturing a product), and suppliers to the die casting industry. The metal casting industry is primarily comprised of small companies, many of which are family owned and operated.

NADCA is the result of a merger between the industry's two long-standing organizations: the American Die Casting Institute (ADCI), a trade association founded in 1928; and, the Society of Die Casting Engineers (SDCE), a professional society founded in 1954. In January of 1989, these two outstanding organizations joined together as the North American Die Casting Association (NADCA) to better serve the needs of the die casting industry. NADCA is now the single, strong, unified voice for the die casting industry in technical education, research and government relations.

INDUSTRY BACKGROUND

Gamco Products, of which I am President, is a small to medium-size company which produces very high quality plumbing hardware

3

(faucet parts, tub spouts, handles, etc.) and appliance parts through the die casting process. Our plant is located in Henderson, Kentucky. We employ approximately 250 employees and have been in business on the same site for over 30 years. We proudly claim to be an important part of the community as a source of employment and income, contributing to the continuity of what we see as the American way of life.

In addition to the type of castings which my company makes, the die casting industry encompasses a wide variety of products that have a direct effect on the quality of American life. Examples range from door knobs and parts of the watch you are wearing to transmission housings and many other components in the car you drove today. Aircraft cabin components, computer chassis, disk drives, printer components, wave guides in microwave ovens and radio antennas, chain saw parts, small engines for lawn mowers and boats, as well as aerospace components, are all made by die casting.

The metal casting industry has become a highly technical industry. The die casting industry, in particular, is highly mechanized and automated, geared to high quality production which uses a wide spectrum of technical disciplines, including metallurgy, engineering and electronics. As stated, the industry is comprised mainly of small companies which owe much of their efficiency to this diversity. However, this necessarily results in the diffusion and fragmentation of research efforts. The North American spirit of competition between such small companies makes

for an efficient industry with low manufacturing costs and high productivity, but conversely produces low profit margins. The size of most companies and these low profit margins severely limit any individual company's ability to engage in necessary research and development.

OFFSHORE COMPETITION

In the past few years, the die casting industry has found itself increasingly in competition; not so much with its neighbors, but worldwide. Our markets have become threatened, particularly by the Asian basin countries which have the advantages of cheap labor and far less stringent environmental regulations.

As a die caster and a member of NADCA, I have traveled to the Far East and Europe on several occasions, evaluating our industry against their industry and our ability to compete. It is a formidable task indeed to compete. We are confronted with labor costs, medical costs, workmen's compensation and other fringe benefits costs, just to mention a few obligations. In addition, we must deal with the requirements of OSHA, EPA and those state agencies which are concerned with safety and environmental controls. Tooling cost, which is so necessary in our business, is also impacted by these same factors.

I have visited a wide variety of foreign die casting plants: ranging from those with dirt floors in Korea; slightly better ones in Taiwan; to the modern plants of Europe and the ultra modern ones in Japan.

Japan and Europe have a lot of the same problems we have in competing in a world market against the Taiwanese, Koreans, and others. The one thing they do have going for them is that their government is assisting them through research programs. Such research programs give them the ability to have the best technology and to effectively compete in the world market.

Let me give you some examples:

1. When I traveled in Japan and visited different die casting companies, over half of the ones we visited had grants from the government to develop new technology to be shared with the whole Japanese die casting industry - and this was over seven years ago.

   In my opinion, Japan is becoming the best in die casting, taking over the lead from the United States, just as they have in other engineering fields. I believe a great deal of this credit goes to their government for their research funding.

   I believe if our government does not fund these types of research projects, the future survival of the metal casting industry is surely questionable.

2. Another example of foreign competition directly experienced by my own company, GAMCO, occurred three years ago. We made a commercial refrigerator handle for

the ARDCO Company of Elkton, Kentucky, which is located about 100 miles from our plant. Their annual order on this part was 250,000 pieces with a selling price of over $2.00 per piece -- a total of at least $500,000 in sales to us annually. We lost this job to a Taiwanese company because their price was 25% less than ours, or a savings to ARDCO of $125,000 per year.

If we do not stay at the very top of automation and technology, and this can only be accomplished by research, this type of experience will, no doubt, continue and probably accelerate.

3. During a visit to the Asian Basin countries (organized by the trade association), we saw die castings which had been transferred from a U.S. manufacturer to a plant in Hong Kong. The plant itself was on the 20th floor of a high rise (apartment-type) building. Liquid effluent was drained directly onto the ground underneath the highway ramp at the side of the building. Airborne emissions went to roof-mounted smokestacks, operators wore no protective clothing, only T-shirts, pants and sandals, and machines were totally without safety guards.

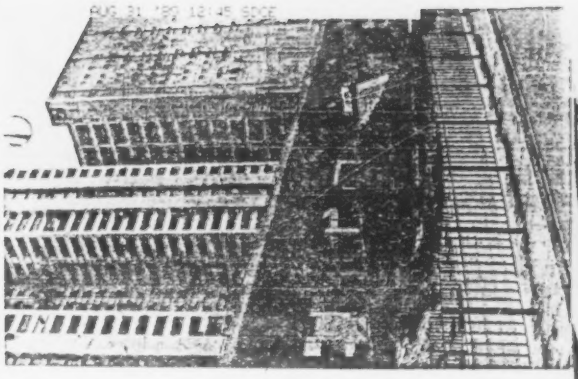
However, modern technology, in the form of the latest design runners and feeds, was being used to increase

quality and production rates and to reduce metal melt. The technology had been provided by an arrangement between the government-sponsored Hong Kong Productivity Council and the Zinc & Lead Asian Service based in Australia; some of the technology had originated in the United States.

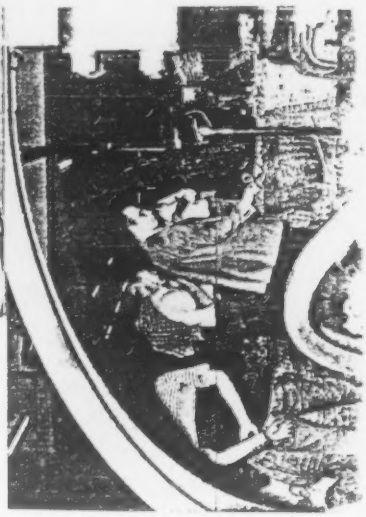
The only way we can stay competitive is to achieve a high degree of automation and to set quality levels which cannot be met offshore. In addition, we need to strive for higher levels of productivity by reducing cycle times and eliminating extra operations, such as labor intensive polishing and finishing, in order to keep prices down. The bottom line is that we need to use technology to combat cheap labor; and, we need science (that is available to our foreign competitors) to satisfy our environmental constraints.

We are already doing this with existing resources, and NADCA is a vital part of this effort, but it is a race against time. We need a higher pace of research to develop new techniques and "home-grown" experts skilled in new technology to enable us to keep ahead. In short, we need centers of expertise specializing in die casting such as those to be established by S. 775.

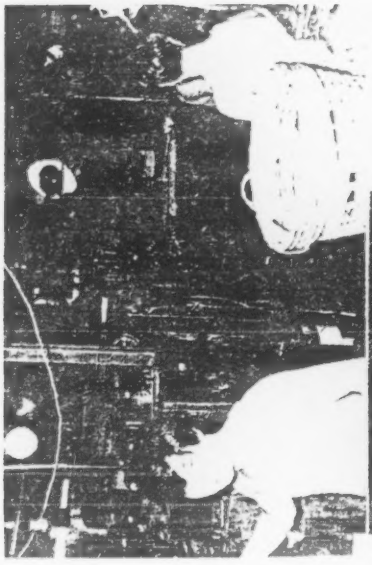
Thank you once again for this opportunity to testify before you in support of the Metal Casting Research Bill. Mr. Cocks and I would be pleased to respond to any questions you might have at this time.



General inside view



High rise building housing Pac...ific.



Work stored in wicker baskets.

Mr. Smith and Mr. ... decide a pattern using ... system.

STATEMENT

OF

DEREK COCKS
TECHNICAL DIRECTOR OF THE
NORTH AMERICAN DIE CASTING ASSOCIATION

IN SUPPORT OF S. 775

A BILL TO ESTABLISH THREE CENTERS FOR
METAL CASTING COMPETITIVENESS RESEARCH

BEFORE THE

ENERGY RESEARCH AND DEVELOPMENT SUBCOMMITTEE OF THE
SENATE ENERGY AND NATURAL RESOURCES COMMITTEE

SEPTEMBER 21, 1989

Mr. Chairman and members of the subcommittee:

My name is Derek Cocks and I am the Technical Director for the North American Die Casting Association (NADCA). Thank you for permitting me to submit written testimony for the record on behalf of NADCA. This statement is intended as a supplement to the verbal testimony of Mr. R.D. Smith of GAMCO Products Company in support of S. 775.

I hope to offer you a more technical perspective of NADCA's interest in this legislation.

NORTH AMERICAN DIE CASTING ASSOCIATION - Position on Research & Development:

NADCA has historically been committed to upgrading technology, which is vital to the survival of the die casting industry. The association has done so through the allocation of time, monetary resources and staff. We have been involved nationwide in research, distribution of technical materials and education.

A prime example is our ongoing relationship with the Ohio State University. This is a joint effort on the part of industry and the National Science Foundation supporting the Engineering Research Center which engages in interdisciplinary efforts aimed at improving the technology used in manufacturing.

The goal of this teamwork is to achieve a synergistic effect enabling new developments to be used together in a variety of manufacturing industries. For example, a knowledge of heat

transfer coefficients will enable us to mathematically model solidification of molten metals in both sand and metal molds, as well as providing information to the precision forging industry.

At the program's outset, the die casting industry provided (through considerable effort) a half million dollars worth of equipment as well as additional technical expertise, to successfully launch the die casting portion of the center's programs. This reference is made to demonstrate that the metal casting industry stands ready to work in a much needed industry/government partnership to attain the goals of the legislation under review.

The Die Casting Process:

All casting processes are "near net shape" in concept. This means that the path from the molten alloy to the finished product is short and efficient, especially in the use of energy and materials. Scrap and discard are minimal and are usually consumed within the process. Die casting is the most highly developed of the casting processes, and lends itself perfectly to the goals of the bill, energy conservation and competitiveness.

Die casting differs from other, more conventional, casting processes since it employs reusable steel molds, thus producing very accurately dimensioned components with thin walls which require minimum machining or other secondary operations.

3

There is still a strong need for further developments. These will enable the production of components using even less material and less energy in their production. Such developments would automatically increase productivity and efficiency. This is particularly true since our industry is primarily comprised of small companies, without the individual resources to carry on such research. An approach of the type outlined in S. 775 guarantees the creation of public domain technology which could be of benefit to the entire industry and not just a select few.

Energy, Recycling & Environmental Considerations:

It is important to recognize the potential energy savings and material recycling which could be achieved through research. For example, the metals used in die castings are all currently being recycled. Aluminum castings are made from material which has already been recycled at least once; this uses less than 50% of the energy to produce primary metal which must be used by other manufacturing techniques.

The casting process also consumes less "energy of conversion" for the manufacturing operation. Zinc die castings are made principally from primary alloys but a very large percentage of the metal is recycled to produce many other products, from galvanized sheet to paints and medical supplies. Magnesium, the "metal of the future" is manufactured from sea water, giving both ecological and national security advantages. In comparison, the plastics

industry, despite intense materials research, is only now considering viable techniques for possibly recycling some of its products.

Modern electronics depend on the properties available from modern die cast components. Good thermal conductivity keeps the electronics cool. The inherent stiffness of metals protects and supports the electronic components and the mechanical systems they operate. The high electrical conductivity gives electronic shielding and protects the user from radio frequency emissions. By stimulating research within and on behalf of the metal casting industry, its competitiveness will be improved and its products will be enhanced thus allowing wider application. Die casting is 'high tech' manufacturing, which, as we have shown, is economic of materials, is economic of energy and ecologically sound.

WORLD COMPETITION:

Other governments (especially in Europe) have been much more supportive of their industry over the past decade, with the result that there are many "Centers of Expertise" found in Europe. The following "Centers of Expertise" are known to exist with the staffing levels indicated.

	ORGANIZATION	APPROX. STAFFING
United Kingdom	BNF Metals Technology Center	100
	Steel Castings Research & Technology Association	140
	British Cast Iron Research Association	50
France	Centre Technique de la Fonderie	300
Germany	Institut Fur Giessereitechnik (Gmbh)	50

5

Austria	Osterreiches Giessere-Institut	30
Sweden	Swedism Foundries Assn.	25
Spain	Inst. Technologico di Materiales (INASMET)	(not known)

We do not have full details of the work being carried out or the available budgets, but it may be significant to note that in recent years the United Kingdom government provided just over $3 million for research and technology transfer in that country's castings industry. We understand that similar assistance is being provided in Japan, Korea and other south east Asian countries in competition with U.S. industry.

Some other countries have been exerting greater efforts to increase their competitive edge in the metal casting industry. Research, which has proven highly successful in saving energy was carried out by the Zinc Development Association/B.N.F. Metals Technology Center. Funding by the United Kingdom government from 1978 to 1981 enabled the development of flow technology to the point where it was used in industry, producing many improvements in productivity and quality of castings. As a "spin-off", a saving of around $2 million per year was made by reduced scrap remelt. Note that this was only in the zinc industry in the United Kingdom which has a market of only one seventh of that in the U.S. If we translated just this one saving to the North American market, and included the aluminum die casting industry the equivalent U.S. saving would be $50 million. Remember this is only spin-off from one technical development.

A further sense of urgency arises by virtue of the European Economic Community (EEC) plans for united economic development, officially beginning in 1992. Surely those plans will include enhanced R&D efforts.

The above is only one example of increased global competition facing all aspects of American manufacturing. Technology transfer, enhanced education levels and improved production facilities are essential, not only for growth, but to the very survival of the United States metal castings industry.

SUMMARY:

I repeat our previously stated support for the passage of S. 775 sponsored by Senators Shelby and Helfin.

Summarized, the key reasons are:

1. The casting process is an important manufacturing technique in the United States. It is economic of materials, energy and resources and its survival is important to the quality of life in this country.

2. If we do not respond to the challenge of world competition in research, development and the application of new technology in the castings industry, then we could lose the battle for a viable casting industry.

3. Implementation of a castings industry/U.S. Government partnership in research, involving close liaison with manufacturing industry would be an investment, not an expense. The result? Technology transfer to the shop floor!

4. The synergism of bringing together research programs with industry expertise and academic ability under a common "umbrella" would lead to efficiency of effort and a rapid payback of investment.

Senator FORD. Thank you very much, Mr. Smith.

I think when the general public talks about die casting—I think Mr. Kiplinger expressed it earlier—you just do not pour some melted steel into mold and let it cool, you know. What metals do you use other than steel or aluminum?

Mr. SMITH. Zinc, magnesium, are the other die cast metals.

Senator FORD. So it is not just steel or iron or aluminum.

Mr. SMITH. Absolutely.

Senator FORD. You have a variety and that must be mixed in order to make certain type of product. Mix sometimes has to be right. I guess every time it has to be right.

Mr. SMITH. Absolutely.

Senator FORD. Or you cannot sell your product.

Mr. SMITH. Absolutely.

Senator FORD. Now, Mr. Smith, how difficult will it be, or will it be difficult, to get industry to share in the cost of the centers, and if so, should that be mentioned in this piece of legislation?

Mr. SMITH. Well, I think that we have gone on record similar to the other that we plan on matching with the centers, the government loans as well in this area. I think we are on record as saying that; in Derek's information, I think that is mentioned.

Senator FORD. Fine. I have seen some examples where new technology has been used extensively in other countries but not here. You touched on a little bit of that, but could you elaborate on it just a little bit?

Mr. SMITH. Well, I think that a great deal of the technology, I will expand on it a little, and then I will let Derek answer it a little more so.

At our end of the industry, you know, we have put modern robotics into operation as far as on our casting machines. We have already made great strides in that area as far as automation. I will let Derek answer some of the other things we have done as far as the technical end of it.

Senator FORD. Mr. Cocks, would you like to elaborate on that a little bit?

Mr. COCKS. I think, first of all, one should say that technology does not go smoothly. You get a sudden leap forward and then very little happens for a long time. There was a major breakthrough in technology in Australia of all places in 1977.

And what we had been doing since then, is refining that major breakthrough, making it into techniques which could be used by die casters on the shop floor and showing them how to use it in their plants. And that is the sort of thing that makes things like this possible, 60,000 thick casting, very thin wall, very light, therefore economic of materials of energy and of labor. And incidentally, it sort of doubles your production rates.

So that sort of thing occurs from time to time. Previous speakers have talked about funding particular research topics. Well, that is great if you can identify what those topics are going to be beforehand, but sometimes they really spill out almost accidentally. Get a good team together, and these guys generate technology that nobody ever thought of before. That is the sort of thing we are looking at.

Senator FORD. Mr. Cocks, what technologies have foreign competition developed and used that American companies have not. You talk about Australia—that is one which you are using. But what about—are there any new technologies that foreign competition has developed and that we are not using in this country?

Mr. COCKS. Yes. I think in the area of thermal control of dies. There is far more of that used and far more known in Europe. And in vacuum technology, probably also in Europe, they are ahead of us in that. We are trying to catch up, but we are behind in my opinion.

Senator FORD. Mr. Smith, do current trade laws still allow for dumping of low cost castings?

Mr. SMITH. Absolutely.

Senator FORD. Is it big, been declining or getting larger?

Mr. SMITH. I think it has probably leveled off, alluding to the previous gentleman's testimony, because of the dollar stabilization of some not, you know, somewhat falling, has stopped the immediate going down, but I expect that as soon as—depending upon what the dollar does, it is going to have a direct effect on whether it continues or not.

Senator FORD. Senator Heflin.

Senator Heflin. I do not have any questions.

Senator FORD. Let me—I do not understand the position of the administration, to be very frank with you. And I say that for the record. And if they can convince me that I am wrong, I have always understood that government cannot be all things to all people and should not be. But when the government has an opportunity to take some leadership and to join with industry to develop a more competitive atmosphere, it seems to me, they ought to grasp that situation rather than refute it.

And so, where you have the opportunity to put centers together to do the technology and phasing in, where you as a member of industry will serve with university people to develop that—the real world problems with academia, and you begin to put those together so you can put more people to work and have more membership, it just seems to me, that is the logical way for government to operate.

Now if you are going to withdraw, and say I have only so much money and I am only going to dole it out here, thither and yon, to those people that may be kind of set up there on top a little bit, they are the good old boy recipients of the money so far. It seems to me that we ought to be able to find those centers; we ought to be able to find universities like Alabama and others, that could be a center and be able to do the needs kind of research.

This is just not about putting coke into furnace and melting steel; we are talking about specialty. And the energy conservation with the lightness of the material in the strength that you are developing from the various metals. So I call upon the administration not to turn its back on an opportunity, that is the way I always have thought government should work.

I thank my colleagues from Alabama for bringing this to my attention, and to have an opportunity to see how it works in my own home state. In fact, right in my back door, my hometown. I tell you, I am going to get better acquainted. It used to be plastics, and now it is metals.

Senator Heflin, do you have anything to say, if not I am going to adjourn.

Senator HEFLIN. No, I do not have anything to say.

Senator FORD. This hearing is adjourned.

[Whereupon, at 3:32 p.m., the hearing was adjourned.]

APPENDIX

RESPONSES TO ADDITIONAL QUESTIONS

Department of Energy
Washington, DC 20585

November 6, 1989

The Honorable Wendell H. Ford
Chairman
Subcommittee on Energy Research
and Development
Committee on Energy and Natural Resources
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

On September 21, 1989, Alan J. Streb, Deputy Assistant Secretary for Conservation, Office of Conservation and Renewable Energy gave testimony before your subcommittee on S. 775, to establish three centers for Metal Casting Competitiveness Research.

Following that hearing, you submitted written questions on behalf of Senator James A. McClure to supplement the record. Enclosed are the answers to those questions, which also have been sent to Senator McClure.

If you have any questions, please have your staff call Frances Bryant on 586-4277. She will be happy to assist.

Sincerely,

Jacqueline Knox Brown
Assistant Secretary
Congressional and Intergovernmental Affairs

Enclosures

cc: The Honorable Pete V. Domenici
Ranking Minority Member

POST-HEARING QUESTIONS AND ANSWERS

FROM THE

SEPTEMBER 21, 1989 HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY RESEARCH AND DEVELOPMENT

OF THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES

UNITED STATES SENATE

WITNESS: ALAN STREB

QUESTIONS FROM SENATOR McCLURE

Question 1(a): Since fiscal year 1988, what metal research and, in particular metal casting research has the department conducted? What were the corresponding funding levels?

Answer: Since fiscal year 1988, the Office of Industrial Programs (OIP), a program office within Conservation and Renewable Energy (CE), has funded metal research and development programs in direct steelmaking, spray forming of steel, superplastic steel processing, thin strip casting of steel, removal of copper from steel scrap, iron aluminide alloy development, metal casting, and electrode development related to the production of aluminum. In the metal casting area, three projects have been funded: (1) the development of precision evaporative casting technology; (2) on-line process modeling of a cupola furnace; and (3) casting modeling. In addition to the research funded by OIP, metals research is also supported by other offices within DOE, including CE's Energy Utilization Research and the Office of Energy Research.

In fiscal years 1988 and 1989, the following funds were obligated to metals research:

Direct steelmaking	$ 8,000,000
Spray forming of steel	1,450,000
Superplastic steel processing	1,500,000
Thin strip casting of steel	137,000

Answer 1(a) continued:

Removal of copper from steel scrap	279,000
Iron aluminide alloys	250,000
Metal casting (foundries)	556,000
Process electroysis - aluminum	3,334,000

QUESTIONS FROM SENATOR McCLURE

Question 1(b): What has been the role of universities, private industry and DOE national laboratories in this effort? What has been the role of research centers in this effort?

Answer: Universities, private industry and DOE national laboratories have all played a role in this effort. The nature of the role is project-specific. For example, in the direct steelmaking project, private industry assumed the major role, with universities serving as subcontractors; in the spray forming of steel and superplastic steel processing projects, DOE national laboratories have taken the lead role, with both industry and universities having important related activities; in the removal of copper from steel scrap project, a university has the lead role. In the metal casting (foundries) area, industry leads two projects and provides significant cost-sharing, with universities also involved; in the third metal casting project, currently in abeyance due to lack of industry support, a DOE national laboratory is primarily responsible for the work.

Other than the DOE National Laboratories, no other research centers are involved in this effort.

QUESTIONS FROM SENATOR McCLURE

Question 1(c): What work do you anticipate conducting in Fiscal Year 1990? What are the anticipated funding levels?

Answer: In the foundry metal casting area, the two active projects, development of precision evaporative casting technology and on-line process modeling, are both fully funded through Fiscal Year 1990 with funds from the Fiscal Year 1988 and 1989 Materials Processing subprogram. Additional projects could be initiated from either the Fiscal Year 1990 Materials Processing budget, or the Metals Initiative budget.

Based on the Appropriations Conference Committee Report, it is anticipated that the Fiscal Year 1990 Materials Processing budget will be $300,000 and the Metals Initiative budget will be $16,900,000. However, we estimate that over $13,000,000 of the Metals Initiative funds will be required for current projects.

QUESTIONS FROM SENATOR McCLURE

Question 2(a): What is the status of implementation of the Steel and Aluminum Energy Conservation and Technology Competitiveness Act of 1988 (P.L. 100-680)?

Answer: Management and Research Plans for this Act have been developed, and were transmitted to Congress on August 18, 1989. Subsequently, over 600 copies of these plans were mailed to personnel in the steel, aluminum and copper industries, labor organizations, Federal Laboratories, universities, other research organizations, independent consultants and other interested parties.

QUESTIONS FROM SENATOR McCLURE

Question 2(b): Would you provide for the record copies of any relevant documents regarding implementation of said Act?

Answer: Copies of the Management and Research plans relating to implementation of P.L 100-680 are attached.

Committee Note.--The documents submitted have been retained in subcommittee files.

QUESTIONS FROM SENATOR McCLURE

Question 3(a): Since Fiscal Year 1988, what solicitations has the Department undertaken for research and development on foundry technologies? What solicitations have been conducted pursuant to P.L. 100-680?

Answer: During April 1988 a competitive solicitation was published by DOE for conducting R&D relative to foundry industry technology development. Funding for this solicitation was from the Materials Processing Subprogram. While funds were authorized for implementing P.L. 100-680, the Steel and Aluminum Energy Conservation and Technology Competitiveness Act, no appropriations have been provided and, therefore, no solicitations have been conducted pursuant to P.L. 100-680.

QUESTIONS FROM SENATOR McCLURE

Question 3(b): What has been the response of industry to these solicitations?

Answer: Industry response to the solicitation for foundry industry technology development was very good. Twenty-one organizations submitted 23 proposals. Two particularly strong proposals were funded within the available budget. The fact that there were a sizeable number of good proposals illustrates why the Department believes that it is better to fund competitive proposals than to establish centers at specific locations.

QUESTIONS FROM SENATOR McCLURE

Question 3(c): What has been the principal constraint on research on new foundry technologies?

Answer: The principal constraint on development of new foundry technologies has been the availability of funds from both private and public sources. The industry is capital intensive, highly competitive, and has limited discretionary funds for investment in R&D.

QUESTIONS FROM SENATOR McCLURE

Question 4(a): If S.775 were enacted, what would be the initial cost and the annual operating cost for each Center for Metal Casting Research?

Answer: We estimate that the initial cost of each Center would be about $5 million. In addition, about $2.5 million would be needed annually per Center for operating costs.

QUESTIONS FROM SENATOR McCLURE

Question 4(b): How would the respective role of universities, private industry and DOE national laboratories be effected by enactment of S. 775?

Answer: It is expected that much more of the foundry metal casting research supported by DOE would be centralized in the three Centers chosen as a result of the legislation. This could hamper technology transfer and the integration of new technologies into current production methods. It could also reduce the potential contribution of universities and national laboratories not selected.

QUESTIONS FROM SENATOR McCLURE

Question 4(c): What non-Federal source of funds would be available to jointly support these centers?

Answer: Based on the testimony given by W. Kiplinger, Vice-President, American Cast Metals Association, and D. Cocks, Technical Director of the North American Die Casting Association, on September 21, 1989, before the U.S. Senate Subcommittee on Energy Research and Development, it appears that industry is prepared to be a financial participant in the proposed research centers.

QUESTIONS FROM SENATOR McCLURE

Question 4(d): If S. 775 were enacted, what effects would these funding levels have on existing program activities, without an increase in Federal funding?

Answer: If S. 775 became law, appropriations legislation required that Centers be established and funding for the Office of Industrial Programs remained constant, other R&D supported by the Office would be seriously affected. $10 million, for example, would be nearly one-third of the annual appropriations provided to the Office in recent years.

QUESTIONS FROM SENATOR McCLURE

Question 5: Under this legislation, would the Department have the flexibility to designate one or more of the existing DOE laboratories as one of the Centers for Metal Casting Research? Should it have such flexibility?

Answer: We believe that S. 775 would not preclude an existing DOE laboratory from being selected as a Center for Metal Casting Competitiveness Research. Each Center would, of course, have to fulfil the requirements of Sections 2 and 3 of S. 775.

In considering possible locations for the Centers for Metal Casting Competitiveness Research, it is possible that a DOE national laboratory could be a strong candidate for such a Center. DOE should have the flexibility to select organizations with the best personnel and facilities available.

○